DECEMBER 26, 1960

PAPER TRADE JOURNAL

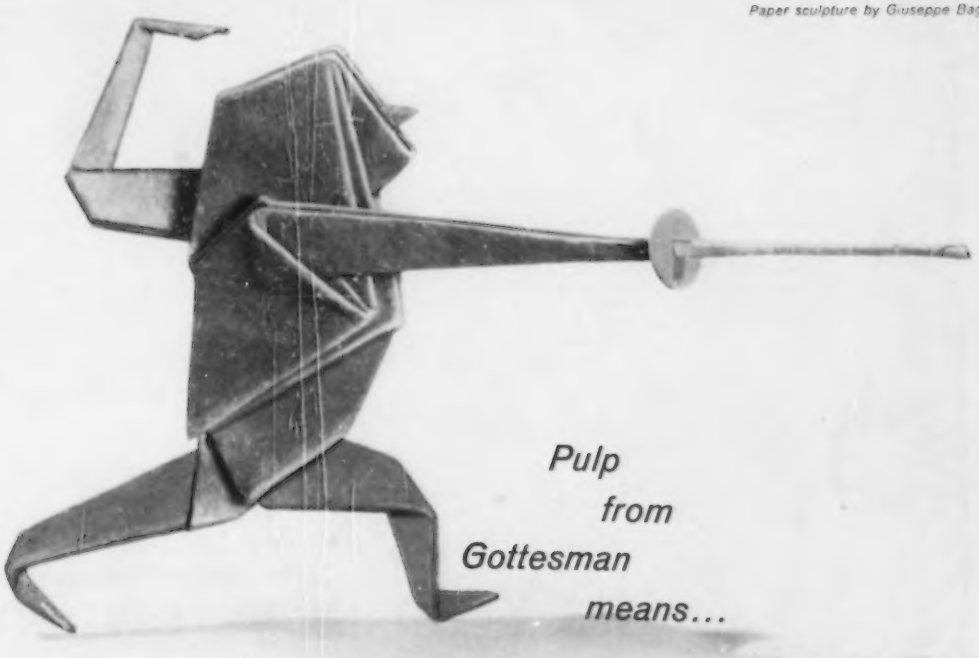
How an Automatic Monorail System Conveys 10,000-lb. Rolls at UB-C

More on Paper Machine Wet Ends: Effects of Auxiliary Components

Heart of Fibreboard's Expansion Is 172-inch Liner Board Machine

For Your Files! This Issue Has 1960 Subject and Author Index

Paper sculpture by Giuseppe Baggi



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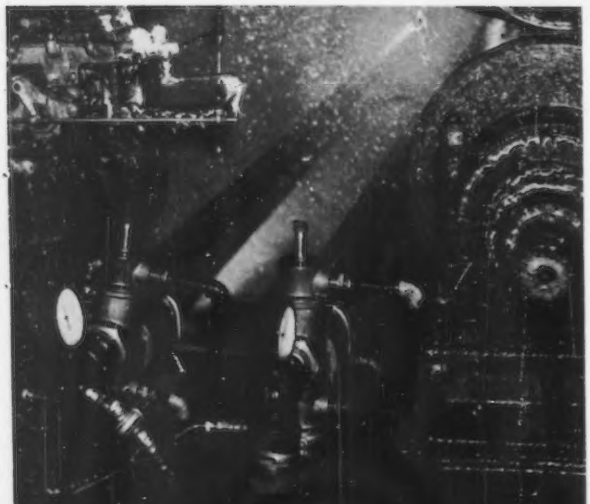
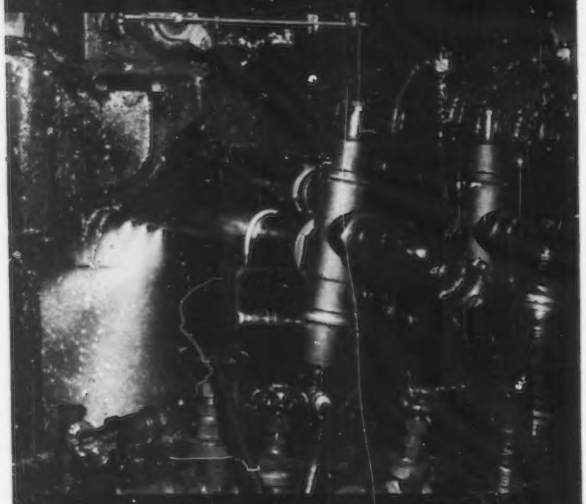
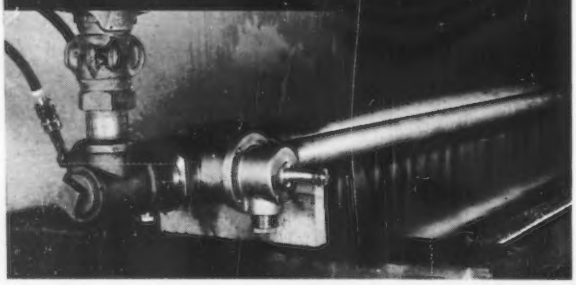


Above and below—
Typical installation of two showers.



Below—
Shower operating on testing tank.
Note simplicity of hook up.



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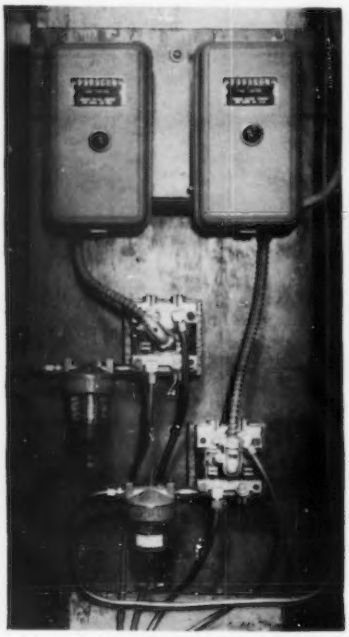

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To Pump*

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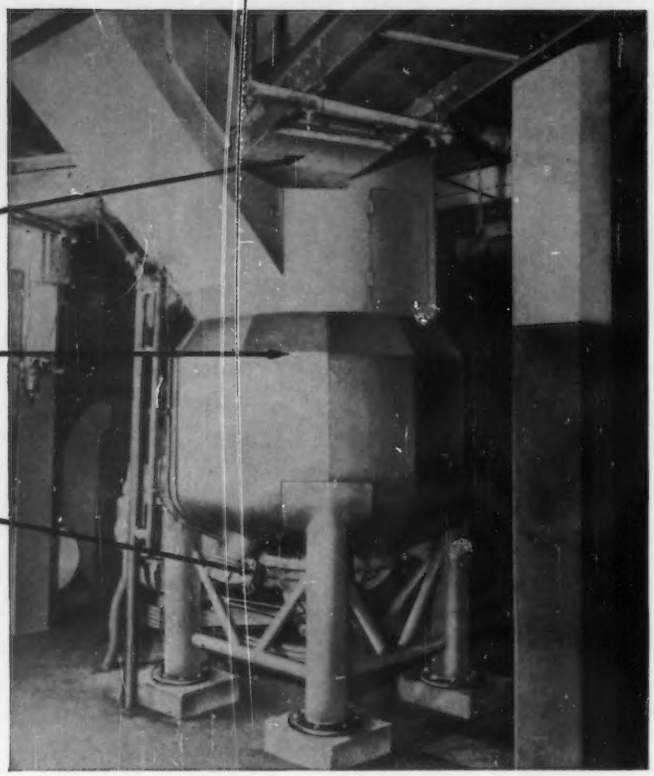

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PAPER TRADE JOURNAL

PUBLISHED WEEKLY SINCE 1872

Week of December 26, 1960—*Vol. 144, No. 52*

TRENDS 7

NEWS OF THE WEEK 9

FEATURE ARTICLES

New San Joaquin Mill Now in Full Operation 14

New Communications System Adds Quality Control at New York and Penn 17

A Conveyor System With "A Mind of Its Own" 18

What About Forming Boards, Table Rolls, Flat Boxes and Dandy Rolls? 23

Year-End Index of Articles for 1960 32

PAPER PEOPLE 10
OBITUARIES 11
NEWS OF CONVERTERS 12
PRICES OF FIBERS 41
NEW EQUIPMENT & SUPPLIES 42
NEWS OF SUPPLIERS .. 43
FIGURES OF THE WEEK 44
CLASSIFIED ADVERTISING 46
ADVERTISERS INDEX .. 50

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REMEMBER THESE DATES

January 24-27, Technical Section, CPPA Annual Meeting, Queen Elizabeth Hotel, Montreal, Canada

February 20-23, Paper Week in New York

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Trends

11 Months Paper and Board Output

Paper and board production for the January-November period this year, according to APPA estimates, was 31.73 million tons, an increase of 1.2 per cent above the comparable period last year. Paper production was 14.135 million tons, up 3.5 per cent; paperboard was 14.61 million tons, an increase of 0.1 per cent, and construction paper and board was 2.985 million tons, a decrease of 1.7 per cent.

Mills Rates Hold Up in December

During the first half of December the paper mills ran slightly over 93% of capacity and the board mills over 90%.

Folding Boxes About Holding Steady

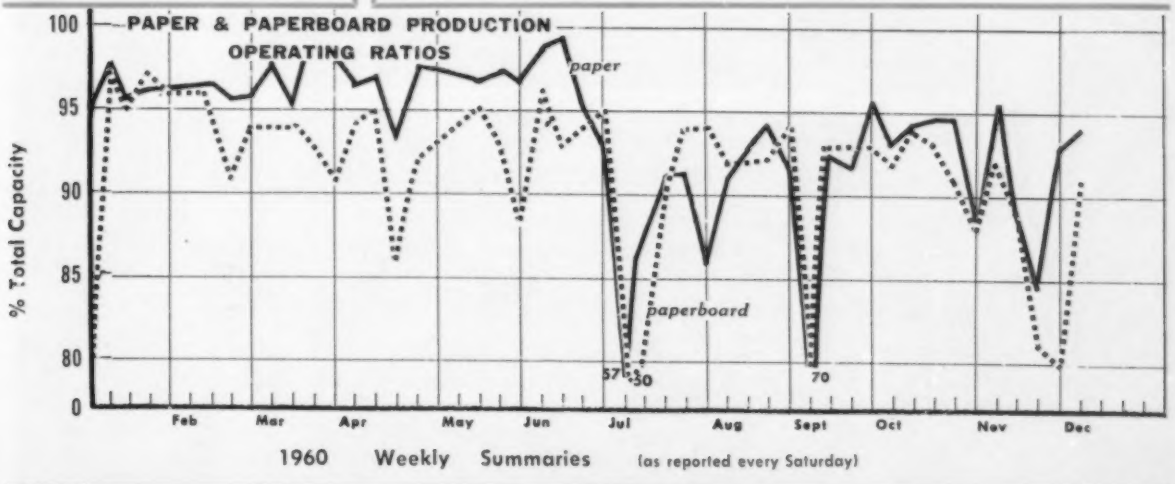
Dollar value of folding box shipments in November was 1.5% under November 1959. Tonnage for the month was 4% below year ago shipments. In the eleven months through November, 1960 folding box shipments just barely topped (0.1%) dollar volume for like period in 1959. Tonnage during 1960, however, trails 1959 by 1.9%.

Forecasting 1961 Fair to Good

How will the new year be for the paper industry? The general economy? It depends on which economist is "Crystal balling." Our industry did much better than business over-all in 1960. It appears that business in general in 1961 will be somewhere between fair and very good. Our industry should do as well or better, excepting such over-capacity areas as linerboard and market pulp.

Bigger and Better Plans for Paper Trade Journal

A year-end check shows that we published 228 feature articles for our readers in 1960, a new record high. As we approach our eighty-ninth year of publication the editors have plans to make Paper Trade Journal bigger and better than ever.



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PAPER TRADE JOURNAL

WEEK OF DECEMBER 26, 1960

SOUTHWEST FOREST INDUSTRIES, INC., recently held an open house for produce growers and shippers, together with industrial company guests at their new corrugator plant in Glendale, Arizona. Raymond E. Baker (center), Southwest executive vice president in charge of the company's paper products group, was on hand to greet Charles Digati (left), Digati Produce Co. and Jim Wingo, Ventura Processors. Southwest's 1¾ million dollar corrugating plant is one phase of the company's expansion into the paper products field.

Grace to Use Bagasse for Clupak Paper in S.A.

The W. R. Grace & Co. subsidiary, Sociated Agricola Limitaded of Paramonga, Peru, has signed a license to make Clupak extensible paper. This is Clupak, Inc.'s, first South American licensee, bringing to 21 the number of licensees in six countries.

Bagasse is the primary stock used in Peru for papermaking and is relatively short-fibered compared with pine kraft. Clupak, Inc., in its research and development laboratory made experimental trial runs and tests of extensible paper made from bagasse and found that the process added materially to the strength and toughness of bagasse paper.

The extensible device will be installed on the No. 1 machine of Sociedad Agricola in Paramonga. The machine has a wire width of 110 inches, and an annual capacity of 15,000 tons. Initial use will be for multiwall sacks, particularly for the shipping of fish meal fertilizer.

Ferguson to Design Alberta Mill

H. K. Ferguson Co., Cleveland, Ohio, has been named engineering and contracting firm for the $38,000,000 pulp and paper mill to be built at Whitecourt by Alberta West Forest Products Corp., Ltd., Edmonton, according to a newspaper report.

Initial output of the plant will be approximately 300 tons a day. Gordon McNabb is president. Whitecourt is on the Athabasca river about 100 miles west and north of Edmonton.

Scott Complete Senior Management Reorganization

Scott Paper Co.'s board of directors has elected four vice presidents and an assistant vice president to newly created posts.

Paul Brown, Loren V. Forman, Thomas B. McCabe, Jr., and Robert Thieme were made vice presidents. James J. Eberl was named to an assistant vice presidency.

Their appointments complete a phase of senior management reorganization that started with the naming of an executive committee, composed of Harrison S. Dunning, Paul C. Baldwin, and Andrew J. Schroder, 2nd.

Champion and Carpenter Paper Plan Merger

Kenneth C. Holland, president and chairman of the board of Carpenter Paper Co., Ohama, Neb., and Karl R. Bendetsen, president of The Champion Paper and Fibre Co., Hamilton, Ohio, have announced jointly that the boards of directors of their respective companies have agreed to recommend to shareholders that the two companies be joined on a basis which will give 1.825 shares of Champion common stock to Carpenter shareholders for each share of Carpenter common stock held.

Carpenter, with headquarters in Omaha, is one of the major distributors of printing, writing, commercial and industrial papers in 26 states in the West.

Paper and Paperboard Production

The American Paper and Pulp Association reported the ratio of the United States paper production to mill capacity for the week ending December 10, 1960 at 93.9 per cent, compared with 93.3 per cent, revised, for the preceding week. The ratio was 97.0 per cent for the corresponding week a year ago.

The National Paperboard Association reported the paperboard production ratio for the week ending December 10, 1960 at 91 per cent, compared with 79 per cent for the preceding week and 96 per cent for the corresponding week a year ago.

(Detailed Statistics on page 44)

PAPER PEOPLE

W. D. Stothert

Columbia Names Asst. Mill Manager at Prince Rupert

W. D. Stothert has recently been appointed assistant mill manager at the Prince Rupert high alpha pulp mill of Columbia Cellulose Co., Ltd. He is a graduate in engineering from the University of Alberta with a Master's Degree from Toronto.

Mr. Stothert was assistant chief electrical inspector for the province of Alberta for several years and later was closely associated with the construction of Canadian Chemical Co.'s plant at Edmonton as chief electrical engineer for Brown & Root, Ltd. Mr. Stothert joined Canadian Chemical in 1953 and moved to Prince Rupert in 1959 as manager of engineering and maintenance.

Mead Papers Promotes D'Addio and Pedersen

G. S. D'Addio has been appointed manager of sales for the Chicago office of Mead Papers, Inc., a wholly-owned subsidiary of The Mead Co., and Lewis E. Pedersen assistant manager of sales.

Mr. D'Addio, a veteran of 25 years in the paper industry joined the Mead Sales Co. in Chicago in 1951 as a sales representative. In 1958, he was appointed regional sales director.

Mr. Pederson became affiliated with the Chicago office of the Mead Sales Co. in 1937 and in 1958 was made assistant to the vice president in charge of that office.

Manistique Names Hoskins Sales & Service Manager

Orson T. Hoskins of Chicago has been appointed sales and service manager of the Manistique Pulp & Paper Co. of Manistique, Mich.

Mr. Hoskins has been traffic manager of the newsprint department, Newspaper Division of Field Enterprises, Inc., since 1956. The Newspaper Division publishes The Chicago Sun-Times and The Chicago Daily News.

Mr. Hoskins has spent his entire career in the paper business. After 10 years with the International Paper Sales Co., he founded his own business, the Hoskins Paper Co., as a paper merchant and converter, in 1946. In 1951, he joined Bulkley-Dunton Co., New York paper merchants.

D. J. Rowse

Rowse Joins Columbia Cellulose

Columbia Cellulose Co., Ltd., announces the appointment of Denis J. Rowse to the position of assistant operating superintendent. Previously employed by the International Fisheries Commission and Pacific Fisheries, Ltd., Mr. Rowse joined Columbia Cellulose early in 1951 as a technician in the filter plant. He advanced to the position of chief process engineer prior to his recent promotion. The duties under his new appointment will be to co-ordinate mill trials and special projects from an operating standpoint and to act as liaison with the technical and process engineering departments.

Mr. Rowse studied at the University of British Columbia for a B.A. degree, and proceeded to post-graduate work at the University of Washington. Prior to this appointment, Mr. Rowse was technical assistant to the operating superintendent.

Henry Peeters

Allied Paper Announces Two Promotions

Allied Paper Corp. has announced that Henry Peeters was appointed to the position of director of production scheduling and Guy Mahoney will replace him as assistant director of production scheduling.

The new director, an employee of Allied since 1947, will direct production scheduling for all Allied Mill Divisions in Kalamazoo. Mr. Peeters replaces Jack Minar who has been transferred to the sales department.

Pulp Chemicals Ass'n Names Research Fellow

The appointment of Robert I. Stephens as research fellow has been announced by A. M. Rankin, chairman of the Tall Oil Products Division, Pulp Chemicals Association. Dr. Stephens will be responsible for research on tall oil products, one of the major sources of naval stores in the United States at the present time. He will be located at the U. S. Department of Agriculture laboratory in Olustee, Fla.

Dr. Stephens has been appointed by the Pulp Chemicals Association to conduct research in a joint study of the Association and the Naval Stores Laboratories with the assistance of the U.S. Department of Agriculture. This program will be devoted primarily to the analysis and composition of rosin and rosin products and to the development of methods for the determination of rosin in surface coatings.

R. L. Clark

G. D. Black

Three Advance at Newton Falls Paper

Effective January 1, 1961, three of the management staff of the Newton Falls Paper Mill, Inc., have been assigned new responsibilities.

Russell L. Clark, general superintendent, has been promoted to the position of assistant to the president.

A graduate of the University of New Hampshire, Mr. Clark first joined the company in February 1949 as a laboratory technician. He left the company in 1951 to go with Mead Corp., Chillicothe, Ohio, and rejoined Newton Falls in 1956.

Gordon D. Black, paper mill superintendent, has been promoted to the position of mill manager. Mr. Black's employment with Newton Falls dates back to June 1926.

J. Wayne Morrow, assistant general superintendent, has been promoted to the position of paper mill superintendent. His employment with the company dates back to October 1937. He is a graduate of the New York State Ranger School, Wanakena, N. Y.

J. W. Morrow

Flintkote Appoints Moran Assistant to President

The Flintkote Co. has appointed James D. Moran as assistant to the president. In assuming his new duties, Mr. Moran will serve "in various administrative activities and functions, handling special staff assignments" under direction of the president, George J. Pecaro, the announcement said.

Mr. Moran, who will make his headquarters at the company's executive offices in New York, is also an assistant vice president of Flintkote.

Mr. Morton will continue to direct the activities of The Sealzit Co., a Flintkote subsidiary whose plant is located at Riverside, Calif. He is vice president and general manager of Sealzit, a position he was named to in May 1960 following acquisition of The Sealzit Co. by Flintkote.

St. Croix Ups Ingalls To Newly Created Post

The St. Croix Paper Co. of Woodland, Me., has announced the promotion of Everett P. Ingalls, Jr., from production manager to the newly created post of director of technical services.

The position of director of technical services was created as a step in St. Croix's development program. Serving as liaison between the woodlands, manufacturing and sales departments, Mr. Ingalls will report directly to the president. As director of technical services, he will provide St. Croix customers with technical advice, market research and new product information.

A 1943 University of Maine graduate with a B.S. degree in chemical engineering and a veteran of World War II, Mr. Ingalls joined the staff of S. D. Warren Co., Cumberland Mills, Me., in 1947 as a production apprentice. Serving in several capacities in the paper department, he finally became assistant paper mill superintendent. In 1953 he was transferred to the S. D. Warren central mill in Muskegon, Mich., as assistant production manager. He was appointed production manager of the St. Croix Paper Co. in 1958.

Littlefield to Retire From Brown Co. Post

Walter A. Littlefield, assistant to the director of research and development at Brown Co., has announced his decision to retire, effective January 1, 1960. Mr. Littlefield, has been associated with Brown Co. since 1929.

After six years with the company's Market Research division, Mr. Littlefield became manager of the New Products and Market Analysis division in 1937.

In 1954, he became manager of the division of Budget and Costs. Two years later, he was transferred from the company's general sales offices in Boston to Berlin where he became special assistant to the technical director, with direct responsibility for new product development. He became assistant to the director of research and development in July 1960.

Riegel Paper Advances Industrial Relations Men

Riegel Paper Corp. has promoted Robert P. Funke to staff assistant, Industrial Relations Department. He was formerly manager of personnel and office services for the New York office of Riegel Paper and Riegel Textile corporations.

Samuel Schaadt, formerly communications co-ordinator in Riegel's Specialty Products Division at Milford, N. J., has been promoted to Mr. Funke's previous position.

OBITUARIES

John S. Walden, III, 44, pulp salesman for West Virginia Pulp and Paper Co., was killed in the plane collision which occurred over New York City on Dec. 16. Mr. Walden, prior to joining West Virginia was with Stora Kopparberg Corp. Previous to coming to New York in 1957, he had served as purchasing agent for Standard Paper Manufacturing Co. and for Manchester Paper Board Co., both of Richmond, Va.

NEWS OF CONVERTERS

Seaman Paper Co. Leases New Building

A new, one-story building containing 20,000 square feet of space has been leased by Seaman Paper Co., according to its president, Joseph B. Seaman.

The new building is located at 1985 N. Anson Drive, Melrose Park, Ill., a westside suburb of Chicago. The general office of Seaman Paper Co., formerly located in Evanston, Ill., has been moved to this new location. The plant facilities will be used for paper converting and die cutting, coating and silk screening of fiberboard and hardboard.

The building was leased from the Dayco Corp. of Dayton, Ohio, for slightly over nine years. It is located on 30,000 sq. ft. of land with a large parking lot adjoining the building.

American Can Establishes New Product Division

The American Can Co. is establishing a new major product division with responsibility for the production and sales of paperboard milk containers. Neil Kingsworth, who has been vice president in charge of manufacturing of the Dixie Cup Division, will become vice president and general manager of the new Milk Container Division, with headquarters at 100 Park Avenue, New York City, effective January 1.

Organization of the new division coincides with the American Can Co.'s first commercial introduction of a new two-quart plastic laminated paper milk container. This division will be the fifth among American Can Co.'s product divisions, which include: Bradley-Sun, plastics and collapsible metal-tubes; Canco, metal and composite containers; Dixie Cup, paper drinking cups and food cups and plates; and Marathon, a fully integrated papermaking operation from wood to finished paper packages and household products. In addition, the new American-Wheaton Glass Corp. is a majority-owned subsidiary.

Hardeman to Be Sales Mgr. At O-I Atlanta Plant

Leon Hardeman, a salesman in the Atlanta plant of the Owens-Illinois Paper Products Division for the past three years, has been promoted to sales manager of the plant.

Mr. Hardeman, an All-America halfback at Georgia Tech University in 1952, will be responsible for corrugated box sales of the plant in the Atlanta area. He assumes a position previously held by Harold Frank, who will concentrate on his duties as plant general manager with supervision over both sales and production.

Downing Announces Major Management Changes

The Downing Box Co. has announced four major changes in its management.

The moves include the election of B. Philip Bowen, vice president and general manager of the company's Cedar Rapids, Iowa, division, to the new post of executive vice president.

Robert H. Christy, vice president, was named senior vice president in the changes. He has been with the firm since 1931.

James F. McDowell, who joined Downing in 1958 as director of sales, was elected vice president-sales and a director of the company.

James A. Daggett, who has been assistant manager of the Cedar Rapids operations, becomes manager at Cedar Rapids.

Mr. Bowen has been associated with Downing Box for 28 years and will have his headquarters in its main offices in Milwaukee.

Downing Box is a subsidiary of the Longview Fibre Co., Longview, Wash.

Corrugated Box Provides Moisture Barrier

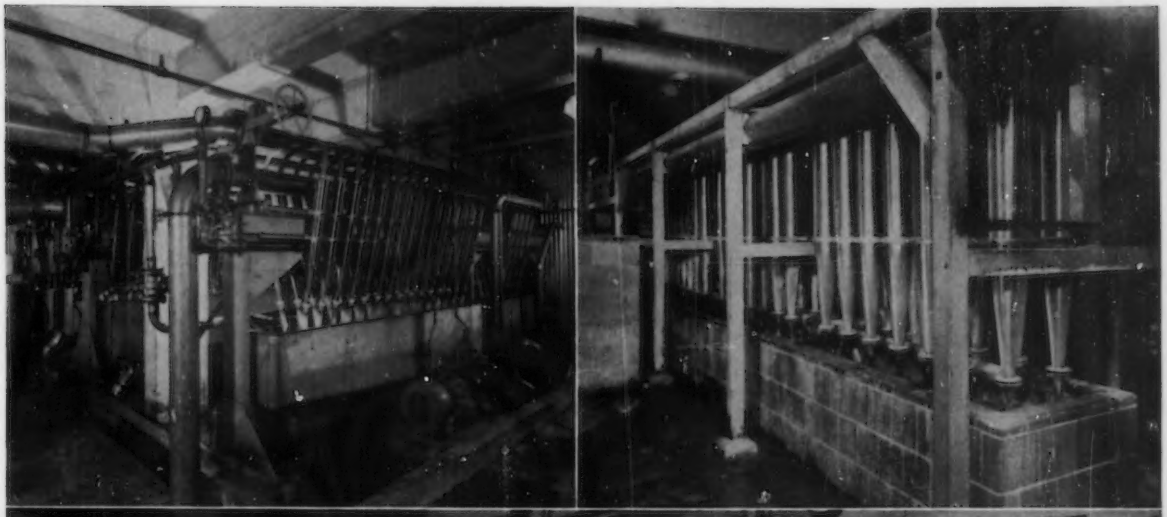
A new corrugated box which provides maximum moisture barrier characteristics has been put into production by the Paperboard Products Division of Consolidated Water Power & Paper Co. It is believed to be the only corrugated board with a

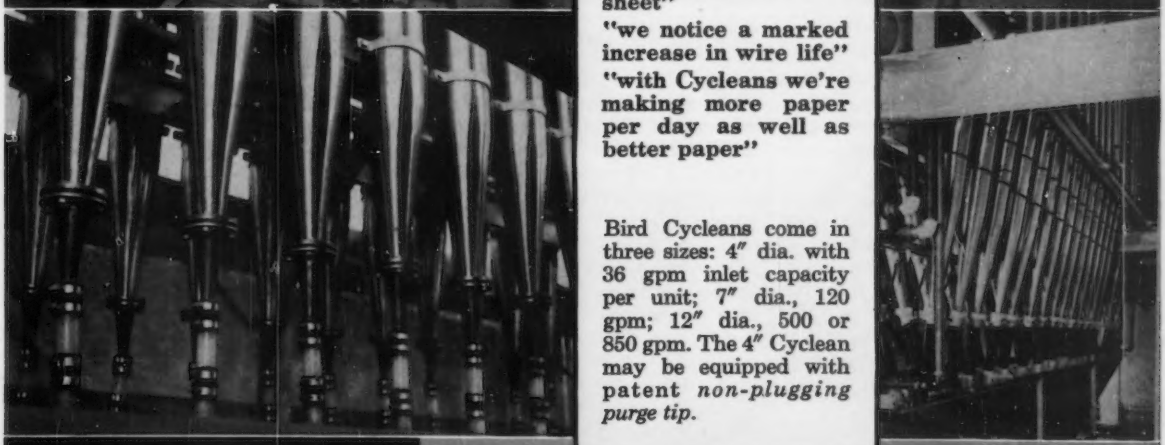
wax-laminated moisture barrier as a part of its construction.

This new box, marketed under the name Consobarr, is being used by Nekoosa-Edwards Paper Co., a producer of business and printing papers, to give superior moisture holdout characteristics essential in shipment and storage of their fine papers. Results have been excellent with the box which has been in use by Nekoosa-Edwards for several months.

Other advantages of Consobarr, in addition to its protection against moisture, vapor and gases, are its cleanliness and its relatively easy waste disposal properties.

A special high-melt wax blend is used to obtain moisture-vapor transmission (MVT) rates in the range of 0.3 to 0.7 gm/100 square inches/24 hours. Other materials currently being used would require much heavier applications and higher costs to obtain MVT rates in this range.





BIRD CYCLEAN users say:

"we get uniformly clean stock — fewer rejects and breaks"

"shive count and dirt count are cut way down"

"improves fibre hydration as well as making a cleaner sheet"

"we notice a marked increase in wire life"

"with Cycleans we're making more paper per day as well as better paper"

Bird Cycleans come in three sizes: 4″ dia. with 36 gpm inlet capacity per unit; 7″ dia., 120 gpm; 12″ dia., 500 or 850 gpm. The 4″ Cyclean may be equipped with patent *non-plugging purge tip.*

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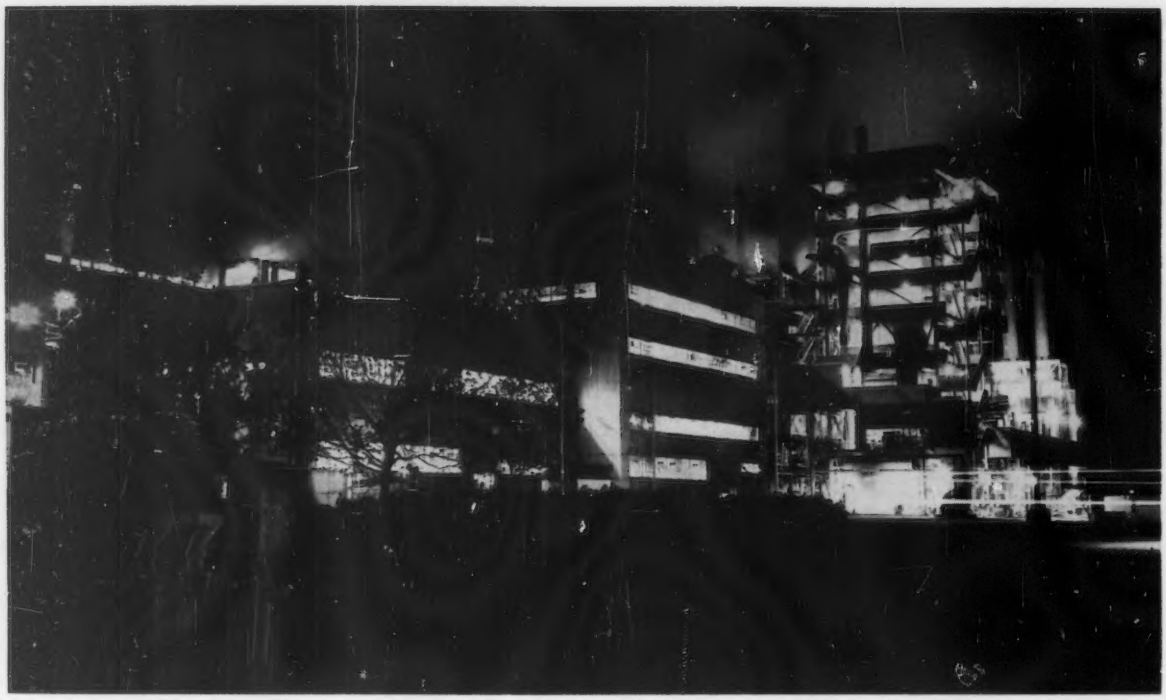


SAN JOAQUIN MILL AT NIGHT. Newly added recovery boiler is at the right side. Power house is in the center.

New San Joaquin Mill Now in Full Operation

Kraft liner board mill of Fibreboard Paper Products at Antioch, Calif., represents latest expansion step of this San Francisco based company.

Expansion by more than a third of productive capacity at California's only virgin kraft pulp and paperboard plant, the San Joaquin pulp and board mill of Fibreboard Paper Products Corp., is now completed and full production schedules are under way. The new mill was a project of Bechtel Corp., international oil refinery construction firm. Fibreboard awarded the contract for the expansion to Bechtel in May 1959, and ground was broken for the project almost immediately.

The expansion has added a third paperboard machine, complete with pulp processing system and additional raw material handling equipment, to the original San Joaquin facility, which was built in 1948-49. The new project is initially to produce 72,000 tons of kraft liner board per year, bringing the total yearly capacity of the plant to over 200,000 tons. Addition of the new capacity makes Fibreboard's shipping container manufacture a fully integrated operation.

Heart of the expansion is a 172-inch Black-Clawson fourdrinier machine. It produces kraft liner for use in the company's six Western container manufacturing plants. Before the new construction, the San Joaquin plant already manufactured corrugated medium for shipping container manufacture as well as bleached kraft paperboard for use in the production of food cartons in the company's six Western carton plants.

An advanced system of air and water effluent controls was engineered by Fibreboard for the third machine.

Major components of the new construction include chip handling, digestion, chemical recovery, causticizing, pulp washing and pulp refining facilities to support the No. 3 machine, together with facilities for loading and shipping the finished product.

Several elements of the new project were built to enable the production of the machine to be doubled economically in the future. These include a 400-ton Babcock and Wilcox recovery furnace and a nine-foot diameter by 250-foot long capacity Traylor lime kiln.

Chip Handling

The new chip handling facilities provide for improved unloading, outdoor storage by wood species, as well as added facilities for reclaiming and

screening of wood chips. One of the outstanding features of the new chip handling installation is a new Heyl and Patterson car turner capable of unloading up to ten railroad cars per hour. A crew of only two men operates the unloading and controls chip flow to allotted storage areas in an 800 by 200-foot asphalt-topped storage location east of the car unloading stations.

Another technical feature of the new plant is in chip conveying. Chips are conveyed to the manufacturing process by a pneumatic chip handling system. The new system, designed and fabricated by Rader Pneumatics has a capacity of 50 units per hour with air supplied by a 350 h.p. Sutorbuilt heavy duty blower delivering 11,400 cubic feet per minute at 6 p.s.i. pressure.

Pulping Operations

A principal component of the new mill is its continuous pulp digester. After chip screening and blending operations are completed the chips are conveyed to the Kamyr continuous digester. The Kamyr digester is a 100-foot tall, 5,700 cubic foot installation, the first of its kind used in kraft liner board production in the Western United States.

The new mill also features hot stock screening. In conventional screening, the pulp from the digester is first washed and then screened. In hot stock or black stock screening the hot pulp in its black liquor is screened and then washed. The new installation is among the first in U.S. paper mills.

Paper Machine

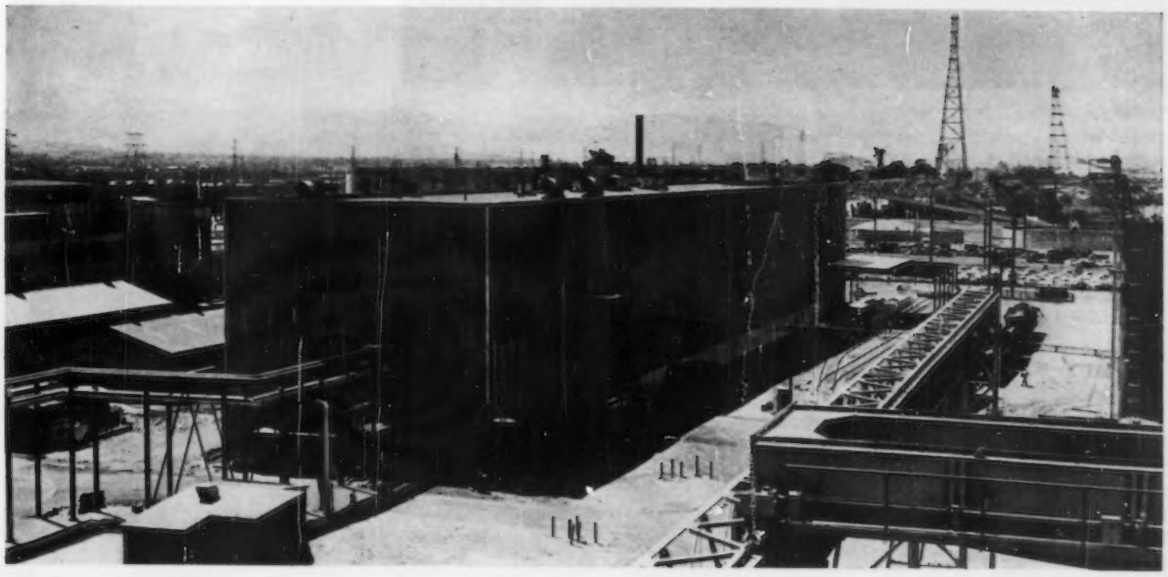
The Number 3 machine, principal component of the new facility, is housed in a building 486 feet long, constructed of steel with asbestos cement panel walls. The machine itself has a total length of 360 feet. The machine was manufactured by the Black-Clawson Co. in its Watertown, N.Y., plant.

Stock for the machine is refined through two 800 h.p. Jones double-D disk refiners and three 400 h.p. Jones Majestic jordans. The 172-inch wide by 133 foot long fourdrinier section of the machine is of the permanent cantilever, quick wire changing type. The primary and secondary airloaded head boxes by Valley Iron Works are designed to operate in a speed range of from 250 to 1500 feet per minute, and to operate on 18-pound to 90-pound natural kraft liner board. The fourdrinier section has nine suction boxes, a 28-inch diameter breast roll, and a 40-inch diameter suction couch roll.

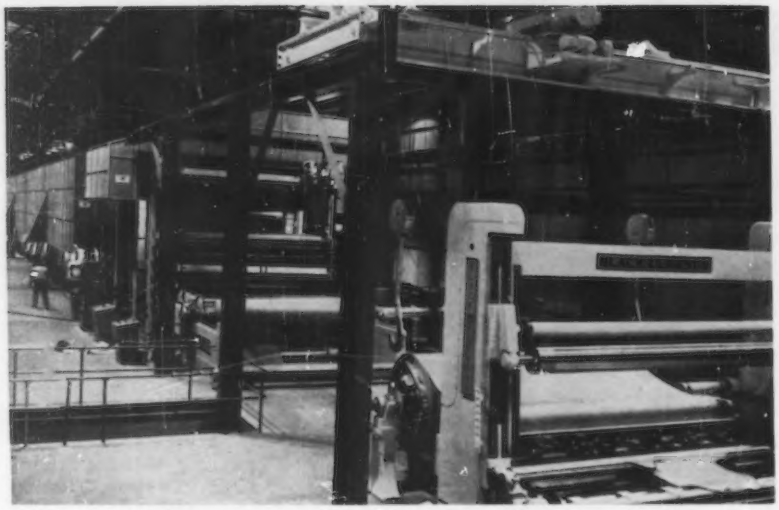
Components of the dryer section of the machine are 54 paper dryers, and four felt dryers, all designed for 125 p.s.i.g. steam pressure. The paper dryers are 60-inches in diameter and 170-inches across.

Following the third dryer section,

Elevated structural steel supported belt conveyor discharges chips from chipper onto piles according to species. The motor propelled tripper is operated by remote control.



New Number 3 machine building. It is 486 feet long, 65 feet wide and 58 feet high. It is a steel structure sheathed in asbestos-cement siding.



One of the first rolls of kraft linerboard to be manufactured on the new third machine at San Joaquin's Pulp and Board Mill is shown on the winder.

two open calender stacks are located with two 60-inch diameter dryers mounted between the stacks. The first stack has eight rolls, the second stack six rolls. A Black-Clawson Auto-Flite super 36 inch reel follows the final calender stack.

Drew Engineering Co. designed and installed the machine hood and associated air systems. The system consists of a dryer hood and a calender hood both fabricated from asbestos cement flat board manufactured by Pabco Building Materials Division of Fibreboard. The vapor absorption system utilizes both fresh air from the outside and hot air from the hood.

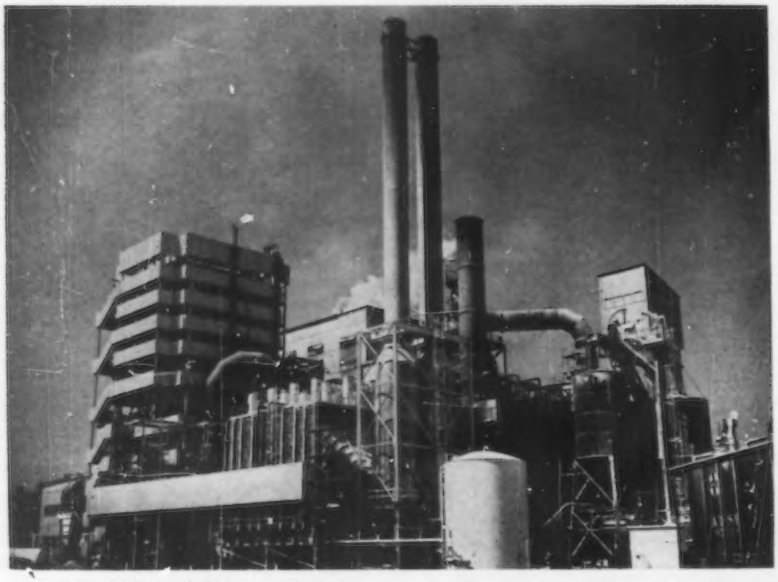
Chemical Recovery

The chemical recovery facilities in the new installation include a sextuple evaporator, recovery furnace, causticizing system and lime kiln.

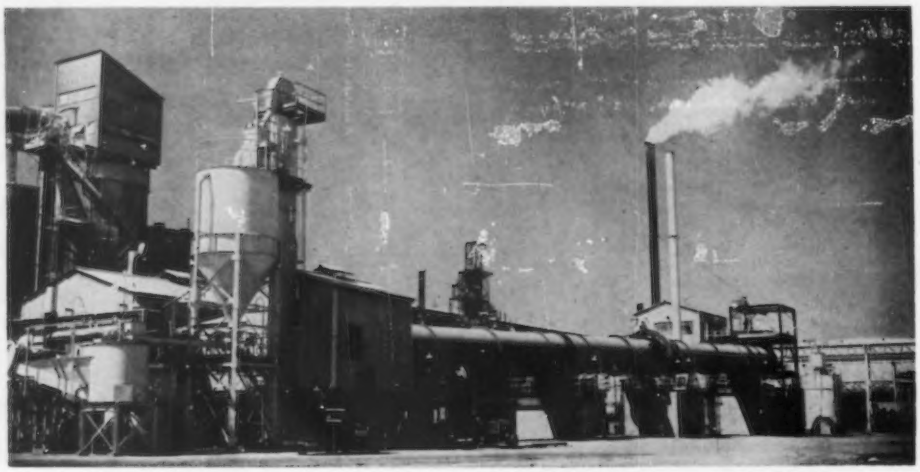
The recovery furnace has a capacity of burning 1,245,000 pounds of black liquor solids per day. Designed and built by the Babcock and Wilcox Co., the furnace produces 197,000 pounds of 600 p.s.i.g., 715° F. steam per hour. All of the steam from the recovery furnace is used to operate the new mill.

An electrostatic precipitator designed by Koppers Co. is a prime factor in control of air effluent. The new precipitator is a double chamber, 44 lane, four-field, separately energized unit powered by three 700 m.s. double half wave silicon power units. It is constructed of acid proof brick.

In addition to the electrostatic precipitator, two Chemico stack flue gas scrubbers contribute to air effluent control. They are Pease-Anthony type scrubbers, each with a capacity of 78,500 cubic feet of 280° F. flue gases. They are constructed of 316 ELC stainless steel, are 12 feet in diameter and 42 feet tall.



Recovery boiler (left), precipitator, (center), scrubbers and stack, all components of the new operation. Units to the right of the foreground tank are part of the original mill.



This is the new lime kiln for the San Joaquin Pulp and Board Mill. Nine feet in diameter, the 250-foot-long kiln will be adequate to supply needs of anticipated future expansion.

Here test results are being written on metal platen at transmitter and sent to machine tender.

Messages are received on this unit as mechanized pen automatically duplicates writing at transmitter.

New Communications System Aids Quality Control at New York and Penn

One of the problems of controlling quality in the paper industry has been the delay in testing paper off the reel, then relaying information as to whether the paper is on or off specifications back to the machine tender or stock preparation personnel. This problem is further complicated when there is a large number of paper machines in the mill and when there is a need to maintain a communications system to a number of remote points. Sometimes this is facilitated by location of labs near the machine or by the use of television. Often mills simply utilize certain people as messengers.

Test Results Transmitted

New York and Pennsylvania Co. has overcome this problem to a considerable extent with a Telescriber system installed at its Lock Haven, Pa., mill by which test results can be immediately transmitted from a central laboratory to various points in the sprawling mill. The system, manufactured by the Telautograph Corp., includes an electro-mechanical transceiver and seven receivers, one being located at each paper machine. With the Telescriber, a message can be written on a metal platen at the transmitter and, via an electro-mechanical system, the message is duplicated simultaneously at the receiver by a pen writing on a similar paper form.

New York and Penn has a highly streamlined quality control setup, and as soon as a sample is taken off the reel of one of the paper machines, it is rushed to the paper standards laboratory. There, it is immediately run through a carefully scheduled sequence of tests for tensile, tear, Mullen, basis weight, ash content, finish, etc. Within minutes the results are available, and it is known whether or not the paper meets quality standards. The Telescriber system is then utilized to send this information to the machine tender concerned.

NEW YORK & PENNA. CO. INC.
LOCK HAVEN DIVISION
QUALITY CONTROL

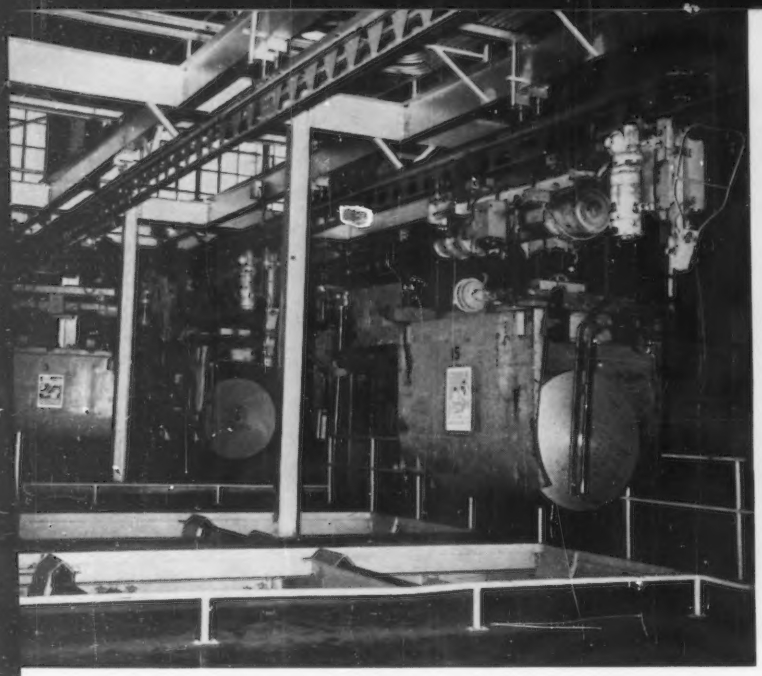
ORDER NO.		MACHINE NO.
SET NO.	DATE	TIME
TEST	TEST	TEST
T/O TS	CAL	ASH
T/O MS	MOIST	INC. FL
SPEC	BS WT	S SM FS
MAX	INT VAR	S SM MS
MUL	BRIGHT	CLAY
ELM MS	DEN	CARB
ELM XD	PH	TOTAL FILLER

Message form used in transmitting and receiving test data.

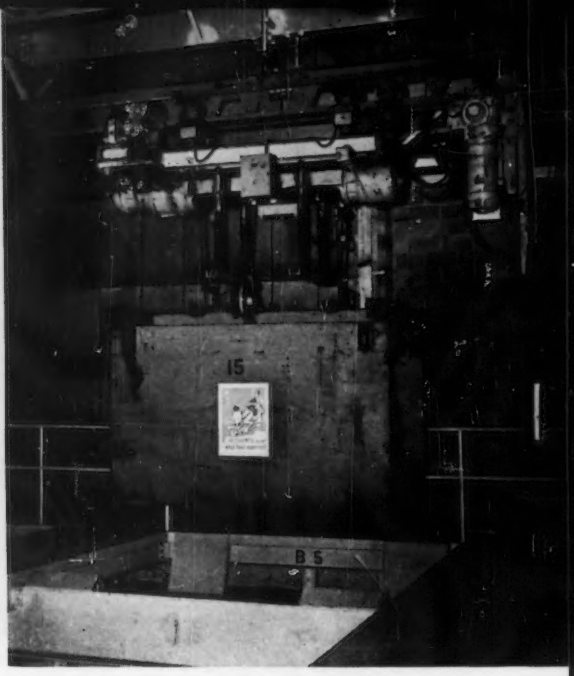
Responsible for Corrections

A standard coded form is used both for transmitting and receiving and significant deviations from specifications are noted on the form. When this information is received, the machine tender must initial the form and time the message was received. Since he has then acknowledged responsibility for the deviation, if any, the machine tender must quickly take corrective measures. The Telescriber message provides a record of the off-standard paper and who is responsible.

From the transceiver at the central lab, test results can be sent to any chosen receiver or receivers. New York and Penn has receiving stations in the machine rooms, stock preparation department and supercalender areas. This system has made possible highly effective control of quality by placing test results in the hands of operating people soon after test samples have been taken.



Roll carrier stops at unloading station while two other carriers wait their turn.



Cradle begins lowering. Electric conductors on monorail furnish power and control signals.

Union Bag-Camp recently attained a production of 2887 tons of paper and board in a single day. This vast tonnage is handled by . . .

A Conveyor System With "A Mind of Its Own"

Paul D. Van Derveer,
Associate Editor,
Paper Trade Journal

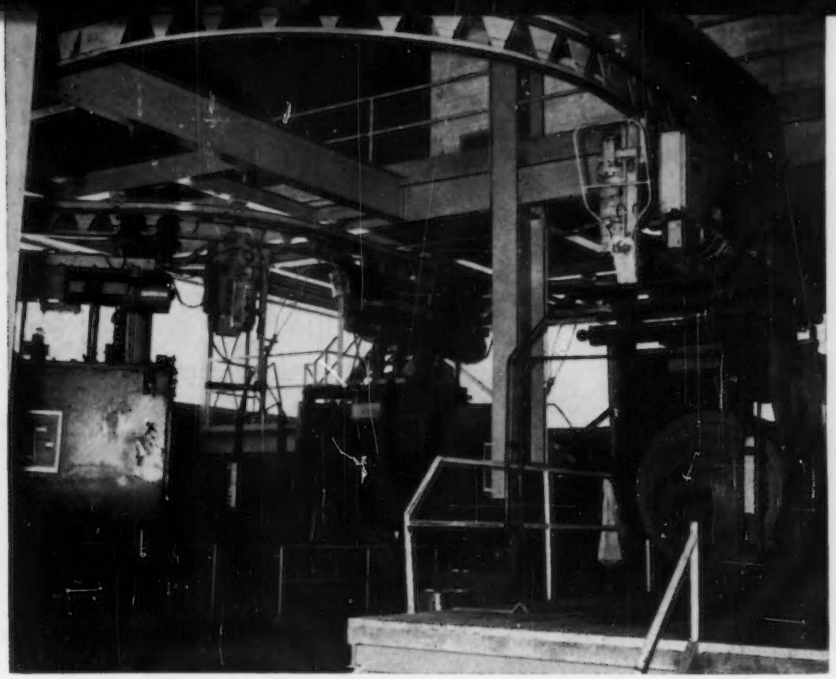
A visitor to the world's largest paper mill at Savannah, Ga., is certain to see, and is likely to be fascinated by, a fantastic mechanized roll carrier device that appears to have a mind of its own. Picking up a roll of finished paper at the end of a paper machine, the carrier starts, stops, chooses its own direction, raises, lowers, opens its grab or closes its grab, all seemingly without benefit of human direction as it carries a paper roll from one of Union Bag-Camp's seven paper machines to shipping or storage.

There are 18 such units handling the mill's production of 2,400 tons per day, and as they travel by on an overhead monorail, an observer is likely to be watching one carrier perform while standing in the path of another, unnoticed, carrier. One visiting paper mill superintendent having had this experience remarked, "Every time I stopped to watch one of those blank, blank carriers another one came up and booted me in the behind!" In spite of this there is no danger in such incidents. The carriers travel at relatively slow speeds and are equipped with safety devices which immediately stop the carrier on contact with personnel or other objects in its path.

The new conveyor system was installed in order to cope with the increased production from UB-C's newly added No. 7 paper machine. The new machine which went into operation last spring would have further burdened an already overloaded roll handling system and so this new automated roll handling system with an overhead monorail was installed. It was designed by UB-C engineers in cooperation with the supplier, Louden Machinery Co. It consists of 18 roll carrier cars, a 1,600 foot long double tracked monorail serving the mill's seven paper machines, and the various loading and unloading stations.

Monorail System

The overhead monorail on which the carriers travel is Louden's "Trojan" rail, a patented rail with a modified I beam shape. There is approximately one mile of trackage in the system with 46 glide type switches which are automatically positioned to direct the car to the proper area. This is a relatively simple switching operation much like a railroad switch. However, at one point in the track system it is necessary to ac-



Carrier unit picks up roll at new No. 7 paper machine. Units are moved to roll pick-up point by manual operation of controller.

complish a change in elevation of 7 feet 3 inches between the old machine room and the new No. 7 machine room. This is done by a hydraulically elevated section of the track and is again entirely automatic. In operation, the carrier travels on to the 17 foot long lift section of track, stops, is raised or lowered to the other level, then continues to its appointed destination.

Loading Stations

There is an individual loading station for each of the seven paper machines, except for Nos. 1 and 2 which are loaded at the same station. Operation of the loading stations is identical except that the board machines, Nos. 2, 4 and 6, are equipped with automatic roll banders.

Rolls produced on the paper machine winder are lowered to the operating floor behind the winder, and then after stenciling, the rolls are manually rolled onto an 18 inch wide, in-floor, roller flight conveyor with concave rollers. This conveyor runs the full width of the paper machine and feeds a 16-inch wide rubber belt conveyor for the bander (in the case of the board machines). These are Signode automatic roll banders capable of banding rolls up to 65 inches in diameter. They automatically band both leading and trailing edges of the rolls before they move onto a 16 inch wide, rubber belt, scale conveyor.

The roller flight conveyor is controlled by stop-start buttons located adjacent to the scale conveyor. The scaleman can also control operation so that the rolls can pass through the bander without being banded. He stencils the weight and number on the ends of the rolls, then operates a hydraulic roll ejector built into the scale table which moves the rolls from the scale conveyor to the roll pickup point. The scaleman or roll handler then moves a carrier from its waiting position to the pickup point through the use of manual controls on the carrier unit.

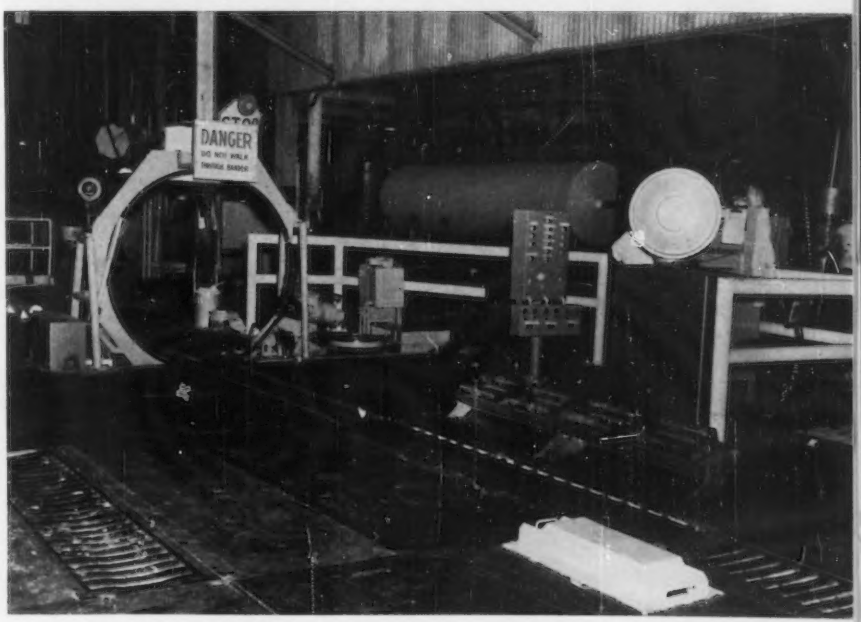
Unloading Stations

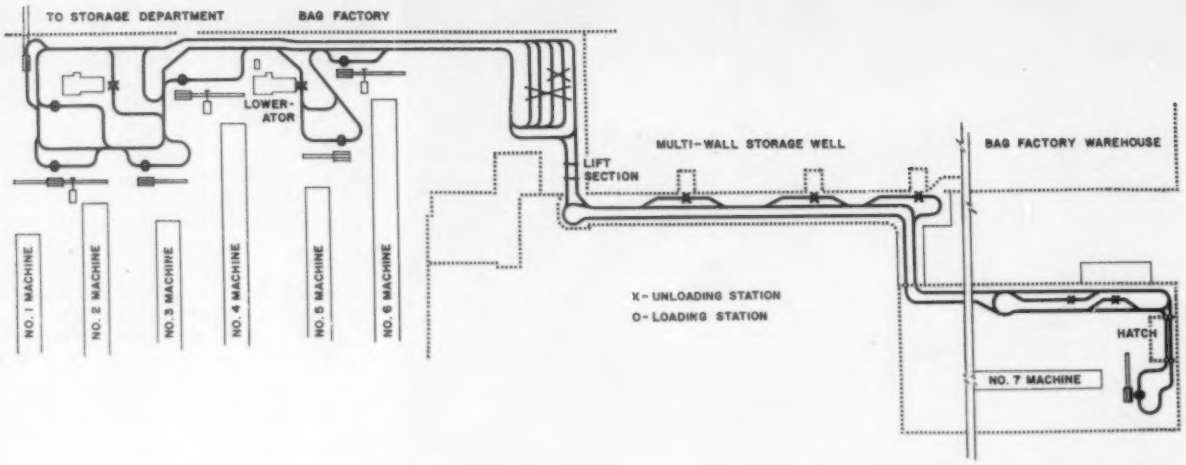
There are a total of 13 unloading stations which are of three different types, that is, they have three types of roll receiving equipment: rubber belt conveyors, automatic roll upenders and tilting tables. The receiving equipment is electrically connected to the monorail to prevent the conveyors from lowering a roll while a roll is in the receiving station. There are four different areas within the system designated as areas A, B, C and D, and unloading stations within these areas are designated as A-1, A-2, A-3, etc. Controls built into the system provide for two additional areas and as many as six unloading stations in each area.

Stations A-1 and B-2 have belt conveyor receiving equipment which discharge onto automatic roll upenders. These are used to lower the rolls about two feet to the operating level in the bag factory. The upenders discharge the rolls on end to a flight conveyor which feeds an eight inch wide live roller conveyor from which fork trucks pick up the rolls.

Equipment at unloading stations, B-3, B-4 and B-5, is similar to the above except that the paper rolls are placed directly on the automatic upenders by the carriers. The truck pick up point also differs in that it is merely a sloped steel plate from which rolls are picked up with a "cake knife" equipped fork truck. These stations are located in the basement approximately 12½ feet below the operating level of the pa-

At end of board machine rolls are conveyed through automatic bander, then are kicked off to roll pick-up point.



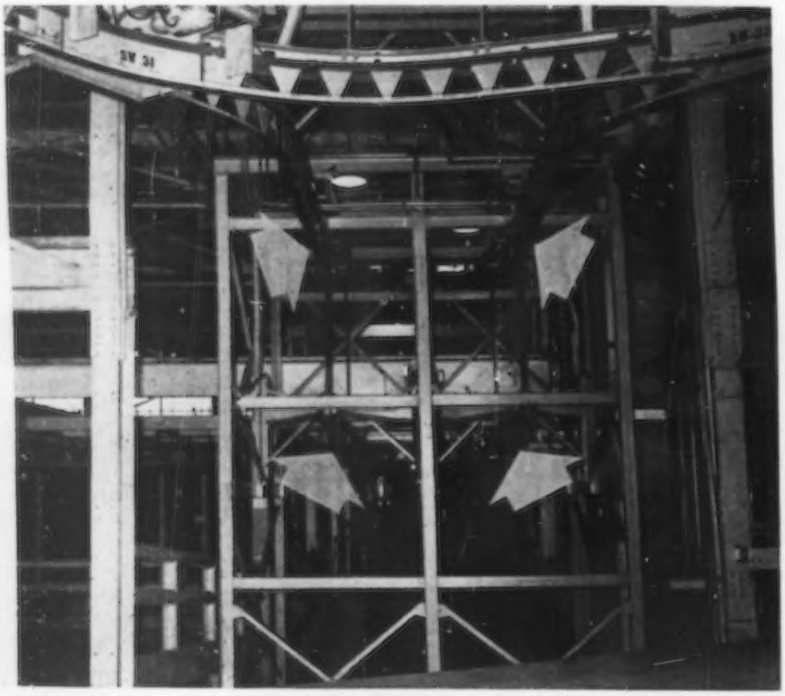


per mill and rolls are lowered to the upenders by the integral hoist mechanisms on each carrier.

The remaining stations have tilting table type roll receiving equipment which dump the rolls of paper, on side, out onto a ramp. They roll down the ramp and at the bottom are picked up by "cake knife" fork trucks. The ramps for some of the stations have roll escapement mechanisms which control the flow of rolls down the ramp and also separate them so they may be picked up by overhead cranes. This type of ramp allows the accumulation of four sets of rolls.

Traveling Units

Although the track system is amazingly complex and the loading and unloading stations remarkable for their automatic features, the unit that is most impressive and actually does the work in handling 2,400 tons per day is the carrier. The traveling unit, designed to travel at a speed of 100 f.p.m. and costing some $12,000 is driven by a master right angle combination gear head motor with twin disk fluid coupling. The two horsepower, 220 volt, electric motor drives a 16 inch diameter solid rubber tired wheel which is pressure mounted against the underside of the monorail. The traveling unit is supported on the monorail by four pairs of nine inch diameter chilled cast wheels and consists of an electric hoist and roll cradle. The hoist which is powered by a 15 h.p. 220 volt electric motor raises and lowers the cradle at a speed of 27 f.p.m. The cradle, or grab, is supported at two points by the hoist and can be lowered to a maximum of 23 feet. It is capable of handling rolls from 19½ to 60 inches diameter and up to 96 inches in length. Maximum capacity in terms of weight is 10,000 lbs. A one horsepower, 220 volt, electric motor opens and closes the grab through a chain and gear drive.



Bottom pair of arrows point to lift section of monorail at old machine room level. Upper arrows show new level 7 feet 3 inches higher.

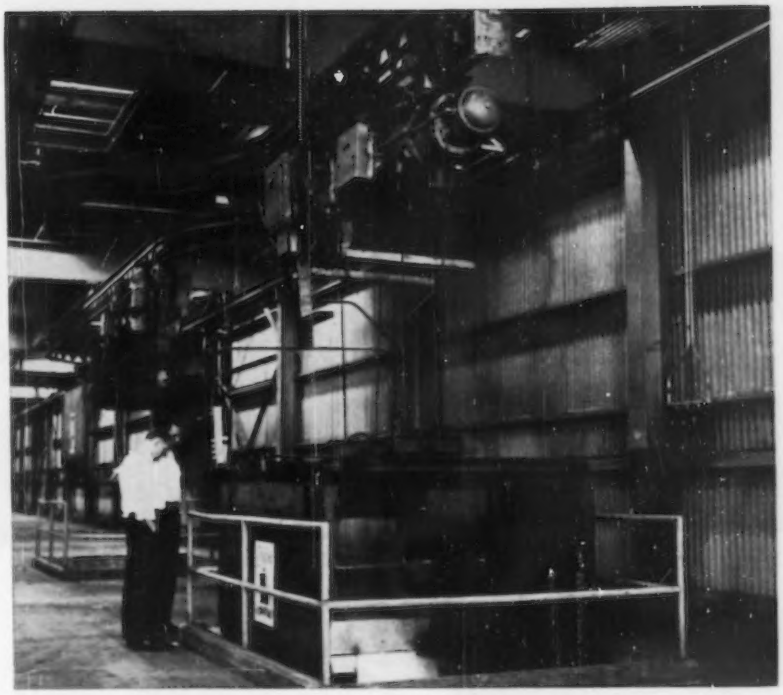
Mounted on the front of the unit is a trapeze-like affair which is a personnel and equipment protective device that stops the carrier automatically if it should make contact with anything in its path. Attached to this device is the selectomatic control with which an operator can designate the unloading station and can manually control the unit. In case the carrier is stopped by an object in its path, it must be restarted by use of these controls.

Electric conductors mounted on each side of the monorail furnish power to, and control the movement of, the traveling units, or carriers. There are four current collectors on each carrier through which signals are both sent and received to control its movements. One current collector receives signals to stop the unit, lower the roll carrier, open the grab, raise the carrier and proceed. A second current collector sends two output signals, one to tell what area the unit is in, and another for the station. A third current collector receives signals from the unloading station as to whether it is clear and ready to receive rolls or not. The fourth current collector is not in use for control purposes.

All output signals from the carrier unit go back to a track control panel, are digested, and then the panel sends out a signal to perform the desired function. The position of the carrier can be detected by the track control panel, and its situation as to whether loaded or empty is denoted by polarized signals from the units.

Each car receives and sends signals as it moves along the track and the electrical system is sectionalized so that a carrier kills the section of control bar behind it and actuates the section ahead. Another carrier cannot collide with the first because the control bar section will remain deactuated until the first carrier moves on.

When the carrier moves to an unloading station, it must stop exactly in position to make proper contact; otherwise it cannot lower. The unloading stations are at various levels and each has a limit switch which signals the carrier's current collector to stop lowering and to open the grab. When the grab is fully open, another limit switch gives the signal to raise.

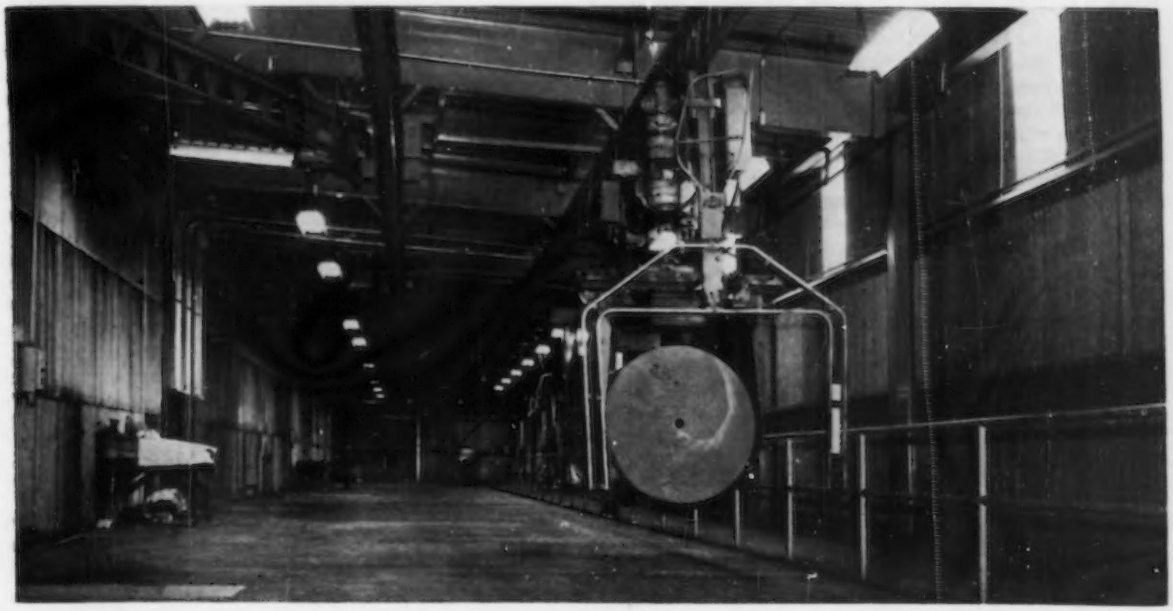


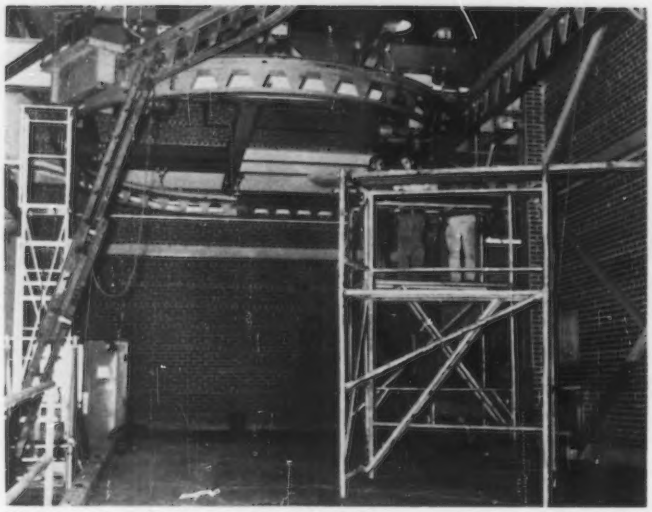
Observers note operation of unit which has just discharged roll. Roll cradle will remain open until loaded again.

Carrier Operation

The carriers can be manually operated by use of the selectomatic control unit attached to the personnel trapeze, and the carrier is initially loaded by this means. The scaleman at each paper machine uses these controls to move an empty carrier from the loading siding to the roll pick-up point. With the manual controls the carrier can be moved forward, backward, up, down, open or closed. The scaleman positions the carrier, then closes the roll cradle. He next designates the station to which the carrier is to deliver the roll by setting two dials on the carrier's selectomatic control panel. One dial designates the area while the other designates the station within that area. The start button is then pushed and the carrier automatically raises

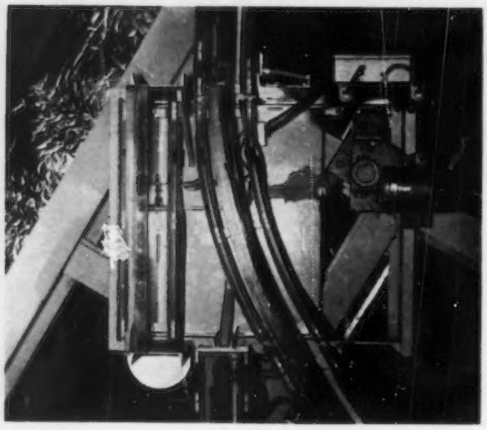
Roll carrier traveling along corridor between new and old machine rooms. Units travel at speed of 100 f.p.m., will handle rolls up to 60 inches diameter and 96 inches in length. Weight capacity is 10,000 lbs.





Workmen install new turnaround point in monorail track system for more efficient use of the eighteen carrier units.

Looking straight up at one of the automatically operated track switches.



Another view of the bander operation. The single bander unit straps both ends of the rolls of board, can handle any length.

the roll to travel position. From this point the carrier performs whatever sequence of operation is necessary to deliver its cargo to the proper unloading station. No further human guidance is necessary until the carrier returns to a loading siding.

The loading siding is connected to the main line by a track switch which is automatically positioned so that the carrier can move onto the main line. If the switch is not clear, for instance because of another carrier passing through on the main line, the carrier will wait on the siding until it is clear. As the carrier passes through the switch, it passes a control point which makes the switch available for other carriers.

The loaded carrier continues on the monorail track system towards its appointed station, selecting the switch position by electrical signals as it moves on its way. When the carrier reaches the designated unloading station, it stops in the exact position to make contact with the station's control points. Then, if the receiving station is clear, the carrier hoist lowers the roll to whatever depth is necessary, opens the cradle and raises the cradle, still open, to the travel position. As the carrier moves away it passes another control point on the electrical conductor which signals the roll receiving station to operate.

The empty carrier then automatically travels around the track system until it finds an empty position on a roll loading siding. Each loading siding will accept two empty carriers except for the siding at No. 6 paper machine which will only accept one due to space limitations. In case all loading sidings are filled the carrier will continue to travel around the main track until a position becomes available. The empty carrier stops in the siding before reaching the roll pickup point, then waits until the scaleman moves it.

Capable of Future Expansion

The conveyor system is said by UB-C engineers to require only a normal amount of maintenance for an installation of this magnitude. When carrier maintenance is needed, the units are moved to a repair siding near the machine shop.

With an eye towards future expansion of the system, the carriers are already wired for additional areas and unloading stations. Changes are currently being made to make the system more efficient in the use of carriers. This is intended to prevent the occasional lack of sufficient carriers at certain points. Another occasional problem has been a jam-up of carriers at an unloading station. Since the system is automatic and the unloading stations in remote locations, it may go unnoticed or unheeded that a number of carriers are waiting to unload at a certain point. This problem is being eliminated by the installation of flashing signal lights in each supervisor's office for each station in his area. One of the early problems encountered was that as a roll was being lowered by the carrier unit, uncontrolled swinging would result. This has been eliminated by the addition of stabilizer springs.

ACKNOWLEDGEMENT

PAPER TRADE JOURNAL is indebted to H. J. Sundahl, construction engineer for Union Bag-Camp for the material presented in this article.

What About Forming Boards, Table Rolls, Flat Boxes and Dandy Rolls?

The effect of these fourdrinier auxiliaries on drainage and sheet formation are discussed in detail from both a fundamental and practical point of view.

Drainage on the wire has been studied by many scientists of high repute and the literature on the subject, which is extensive, will be of considerable help to one who seeks a deeper understanding of the processes. Here we will briefly describe the highlights of these studies and point up their practical significance.

This is the second in a series of articles presentng a fresh look at the fourdrinier. They will later be published as a monograph on paper machine wet ends.

Forming Boards

As the size of the breast roll grew, the span of free wire between breast roll and first table roll became so long that a sag, detrimental to sheet formation, was formed under the impact of the slice jet. The forming board was adopted in order to eliminate this sag and to improve the flow on the wire. A typical forming board is 14 inches wide and has a reinforced plastic top with five slots through which the water can drain freely. There are, however, also solid as well as perforated forming boards.

The board should be placed as close to the breast roll as possible and slightly (say 1/8 inch) below the crest of the breast roll. This is necessary in order to avoid wear of the leading edge of the board and damage to the wire. The board may be sloped slightly upwards in the direction of flow, as long as this does not result in a stock jump. If the board is correctly set, friction between wire and forming board will be negligible and wear of the board will present no problem.

If the slice jet hits the wire on the forming board there will be no breast roll discharge and the stock surface will be comparatively little disturbed. Since, however, more water will be carried down the wire, the risk of skating will increase. (By skating is meant the existence of machine direction ridges which skate back and forth on the wire.) If the forming board is moved forward so that the jet hits the wire close to or at the leading edge of the board, some water will drain through the wire ahead of the board. This makes for faster fixing of the sheet to the wire and less danger of skating. On the other hand, this forced drainage may result in ridge formation and subsequent spouting **(1)**. The position of the forming board in relation to the slice jet is, therefore, most critical and an inappropriate setting may seriously impair machine performance.

The drainage that takes place through the slots of the forming board is comparatively gentle judging from the low fiber and filler content of the white water. It is caused only by gravity and is, therefore, independent of wire speed. Sometimes it is desirable to retard this drainage in order to give the shake more time to act on the stock. If, on the other hand, more drainage is desired than is obtained by gravity, suction can be applied to the forming board by means of drop legs down to the wire pit.

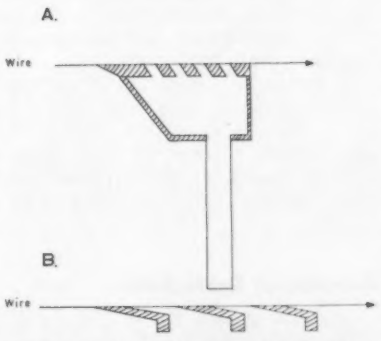


FIGURE 1. A—Forming board with drop-leg to wire pit. B—Foil Type Baffle.

Foil Baffles

If two baffles are made to scrape the bottom side of the wire at a certain distance, the water removed by the second baffle will be largely independent of wire speed. This means that, as wire speed is increased, forming boards and baffles become less efficient as drainage devices. The foil represents an attempt to overcome this drawback of stationary drainage devices as compared to rotating rolls. Although the device has not become generally adopted it is interesting enough to justify a presentation.

As developed by Burchard and Wrist **(2)**, the foil is a baffle one to two inches wide with the leading edge contacting the wire and the top sloping away from the wire at an angle of two to three degrees. The suction that is created in the wedge between the foil and the wire will be at least theoretically proportional to the square of the wire speed, and consequently, more water will be sucked out of the sheet the faster the machine operates. As demonstrated by Taylor **(3)**, the level and distribution of suction between a wire and a foil depends very much on the angle —a certain angle giving optimum

drainage. In practice, drainage will also be influenced, in a rather unaccountable fashion, by the drainage resistance of the fiber mat and the deflection of the wire. One should, therefore, not expect to be able to predict either the total drainage from a given foil or its variation with wire speed. Taylor's equations, however, demonstrate clearly why even a slight wearing of a foil will materially reduce its efficiency. This being one of the morst problems with foils. A number of fails can be grouped together to make a forming board that are wire speeds of 850 f.p.m. and higher will remove considerably more water than flat topped boards. Since the foils can be placed close together they can be made to remove much more water per foot of wire length than table rolls. At the same time, the close spacing will prevent deflection of the wire thereby removing the main factor causing spouting, a phenomenon that will be discussed later. Since drainage by foils is more gentle than by table rolls, the retention of filler will be considerably higher (4).

In view of all this, it may seem strange that foils have not become more generally adopted. It is known that one of the obstacles has been the wearing of the foils by the wire. It is also possible that in many cases the violent stirring action of the table rolls is necessary in order to obtain a satisfactory sheet.

Table Rolls

When the fourdrinier was first designed it seemed natural to support the moving belt of wire cloth on a row of rotating rolls. Since then, table rolls have been built into all fourdrinier paper machines and the bulk of all efforts to improve drainage has been centered on this conception. It is interesting to consider, though, that if the inventors had settled on some other means of supporting the wire, the development of the paper machine would have followed a very different but not necessarily less successful course.

Table rolls are made from brass, steel or aluminum tubing with copper or rubber covering. On big machines rubber-covered steel tubes are a rule while copperclad rolls present the most economic alternative on small machines. Antifriction bearings are desirable on larger table rolls. The rolls must be straight and rigid since any whip or vibration may have disastrous effects on sheet formation, and therefore table rolls for fast paper machines should be dynamically balanced.

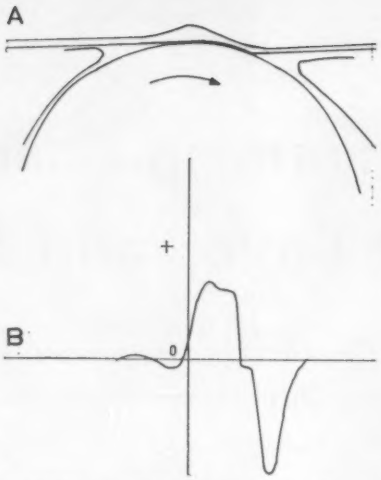


FIGURE 2. A—Drainage at table roll. B—Pressure distribution in nip.

For the same reason very wide and fast paper machines may call for a roll diameter of 14 inches or more. Tappi Data Sheet 9 demonstrates how to dimension table roll for a given paper machine.

Special Types of Rolls

Grooved rolls are used immediately after the breast roll or the forming board when more gentle drainage is desirable. A typical grooved roll consists of a steel tube covered by a ½ inch thick rubber sleeve in which grooves have been cut ¼ inch deep four to the inch. The width of the land between the grooves and the hardness of the rubber must be such that pieces of rubber do not break loose and damage the wire.

The grooved face of the roll should be less than the width of the wire or the wire edge may be caught in a groove and damaged. Grooved rolls are used only on fast machines, where one might find one to five such rolls depending on the drainage capacity of the fourdrinier and other factors, which will be discussed later. They remove some water, but very much less than plain table rolls.

If complete elimination of suction is desired dandy type table rolls are used. Such rolls, which consist of open drums covered by wire cloth, may be found on machines making light weight paper at very high speed.

Function of Table Rolls

At wire speeds below 200 f.p.m. water drains through the wire mainly by gravity and flows down the upstream side of the table rolls, which act as scrapers. Above 200 f.p.m. another phenomenon attains importance—the suction created in the outgoing nip between table roll and wire. The suction is created by the widening of the nip in the same way as when a piston moves in a cylinder (5). The level and distribution of suction in the nip of a table roll have been the object of both experimental and theoretical analysis (2) (3) (5) (6) (7). It appears that:

$$S = C \cdot \tfrac{1}{2} \rho \cdot U^2, \text{ where} \quad [1]$$

S = maximum suction in nip
C = a constant = 1.0 — 1.4
ρ = density of water
U = wire speed

This formula is valid up to 2600 f.p.m. where the steam pressure is being approached in the nip.

The water removed by a tableroll amounts to:

$$q = \frac{D}{F^2} \cdot U^K, \text{ where} \quad [2]$$

q = water removed by a tableroll per unit time and unit face
D = diameter of roll
U = wire speed
F = a drainage factor determined by the sag of the wire, the thickness and porosity of the fiber mat, the open area of the wire and the density and viscosity of the water.
K = a factor determined by the type of paper produced. The compressibility of the fiber mat appears to be the deciding factor.

Equation [2], which was first presented in this simplified form by Tellvik (8), demonstrates the effect of roll diameter, drainage resistance and wire speed on water drained from a tableroll. Unfortunately, both K and F have to be determined before the formula can be used. Tellvik found K to be 0.3 for a kraft furnish while data reported by Wrist correspond to K = 2 for a newsprint furnish. No other data have been published. As for F, Tellvik found this factor to be a straight function of the basis weight of the fiber mat above the tableroll within the basis weight range considered. F was also influenced by the open area of the wire—a fact that is often overlooked in experiments with new types of wire. Headbox consistency, basis weight at the couch and stock freeness were other factors influencing the F values. Since

F will differ from roll to roll, the total drainage Q from a fourdrinier will be

$$Q = \Sigma_n\, q_v = D \cdot U^K \Sigma_n \frac{1}{F_v^2} \qquad [3]$$

Some of the practical problems facing the papermaker in connection with tableroll drainage are:

A. How many tablerolls of given diameter will be needed to produce a given paper at a given speed.

B. What will happen to sheet dryness at the end of the tableroll section if table rolls of another diameter are installed.

C. What will happen to sheet dryness at the end of the tableroll section when the wire speed is changed.

It is clear from the above that as yet problem A cannot be solved without building the machine and making a thorough analysis of it. Maybe, if a large file of data on K and F values for different conditions were available it would be possible to make an estimate. At present, one has to rely on general experiences with similar machines built earlier, which is a most unsatisfactory state of affairs.

Question B would seem to be easily answered with the help of equation [3]: Unfortunately, a change of diameter will result in a different basis weight of the sheet formed above the tablerolls and therefore different F values.

By measuring drainage at different velocities K can be determined and the relation between F and basis weight calculated. It will then be possible to estimate step by step the F values and the drainage from each roll after the change. Obviously, this will be a rather laborious process.

Question C—the effect of wire speed—also has to be attacked by measuring the drainage from a number of tablerolls at various speeds and calculating K and F values from this data. The justification for this process would be that drainage can be estimated at wire speeds higher or lower than those investigated.

Generally, equation [3] shows that drainage is roughly proportional to the tableroll diameter and that it will increase or decrease with wire speed depending on whether K is above or below unity.

The sag of the wire between the tablerolls offers a further complication to the problem of using equations [2] and [3]. It is possible, as Bergström has shown (7), to compensate for wire sag in the calculation of the suction profile; but the effect of wire sag on the factor F cannot even be estimated. It will depend on the stability of flow on the wire ahead of the roll, on the amount of water in the ingoing nip, on stock consistency and on freeness.

Sheet Formation and Table Rolls

As a rule, a crest can be observed above each table roll, which is caused by water thrown into the ingoing nip of the table roll from the roll behind it. The water is pressed up through the wire, disturbing the sheet formed and removing fines and filler from the bottom side of the sheet. After the crest, the wire follows the table roll some distance down, and where it separates from the roll, vacuum is created and is sucked down through the The downward acceleration water from the top of the cre to the lowest part of the wire will — under certain conditions — give rise to an instability of the surface that manifests itself in spouts up to two inches high, which start on the downwards slope after the crest and are fully developed a short distance after the roll. The spouts usually grow from machine direction ridges caused by instabilities in the slice jet or inappropriate slice impact on the wire. The phenomenon is seldom observed at wire speeds below 900 f.p.m. and is very difficult to avoid at speeds above 2,000 f.p.m. The spouts cannot be seen with the naked eye but are visible in a strobolight. In severe cases, the spouts detach globules of stock which may cause considerable damage to the sheet when they fall down on the wire again.

Although the papermaker may not always be aware of the connection, he has reached the speed limit of his paper machine when spouting assumes a certain intensity. Spouting can be reduced by improvements to the slice jet, by a lower angle of impact between slice jet and wire, by more efficient baffles between the tablerolls, by adequate spacing between tablerolls and baffles and — above all — by increased wire tension at the breast roll end (1).

Grooved tablerolls cause very little spouting and this is probably the main reason why they are used.

The wire tension desirable can be obtained by running lower vacuum in the flat boxes, by using flat box covers with a lower coefficient of friction or by switching to moving belt flatboxes.

Since spouting does not develop above forming boards, grooved rolls or foils, it may seem strange that these devices have not already replaced table rolls on high speed paper machines. As a matter of fact, several such experiments are known to have been made. It is understood that satisfactory sheet dryness could be obtained but that the sheet was streaky and of poor formation. Mardon, after examining movie films also reported that ridges reaching a table roll will be split into two or three smaller ridges, which would explain the levelling action of table rolls (1). It is even possible that the shaking up of the sheet at the table rolls has some positive influence on formation, as long as it does not become too violent. If, therefore, table rolls are to be eliminated — which for many reasons would be highly desirable — it may be necessary to devise some other method to help sheet formation.

The wearing of stationary wire supports and the difficulty of resurfacing may also have retarded the replacement of table rolls. The advent of the Teflon laminated plastic cover could mean new impetus to this.

The Dandy Roll

The dandy roll was originally designed to produce patterns or watermarks in paper but is nowadays also used to improve paper quality. It is a wire covered skeleton roll, which rides on the wire above the flatbox section. It is held by journals which revolve in guides, the main purpose of which is to keep the roll in place, since the weight of the roll rests on the wire. The guides also allow easy raising of the roll from the wire.

Above 350 f.p.m. the risk of whipping of a journal type roll becomes serious and the journals are therefore replaced by trunnions, which turn on two small rollers. This design also allows the use of inside shower pipes. The diameter of the roll varies with machine speed from seven inches for very slow machines to 40 inches at wire speeds above 1,000 f.p.m. The diameter determines both the pressure of the roll against the fiber mat and the duration of such pressing.

On fast machines, the dandy roll may be driven by an adjustable speed motor in order to prevent distortion of the sheet by drag between roll and wire. The dandy roll should be a little wider than the wire to hold the wire edges down.

In the ingoing nip, between the dandy roll and the sheet, water is pressed out of the fibermat and up through the meshes of the roll into its inside, where a pool of water is formed. At the same time, a redistribution of fibers should take place

from the heavy spots to the thin spots as well as a compacting of the sheet. On the outgoing side, the extracted water should flow out gently over the surface of the sheet effecting a smooth release of the dandy roll from the sheet, and a further improvement of sheet formation.

These processes are quite sensitive to sheet moisture. If the sheet is too wet, water will collect in the nip and crush the sheet. The defect is referred to as dandy crush marks. If the sheet is too dry, the redistribution of fibers will be inadequate and, since no water film develops between roll and sheet, fibers are apt to stick to the roll and be torn out of the sheet with wet end breaks as result. The best sheet moisture depends on wetness of stock, basis weight and machine speed but the fiber content should be of the order of 94 per cent. As a rule, it is found convenient to place the dandy roll after the two first flat boxes. The wet line should be after the dandy roll.

Two table rolls are used to support the wire underneath the dandy roll. The distance between these rolls should be related to the dandy roll diameter, since it determines the sag of the wire under the weight of the dandy roll, which sag should be neither too small nor too great.

Dandy Operating Problems

Froth or lumps of fibers sticking to the dandy roll will cause spots in the paper (dandy blisters) and, in serious cases, wet end breaks. A dandy roll sticky from pitch may tear the sheet even if it appears clean to the eye. To keep the roll clean, a water shower is placed either right above or inside the roll. On slow machines, a felt wiper behind the rolls aids in distributing the shower water and cleaning the roll. The shower pipe should preferably oscillate. Chemicals may be added to this water for various reasons since it ends up on the sheet surface. The water added by the shower will fill the meshes of the roll cover and thus influence the action of the dandy roll. The rate of flow of this water is one of the things the paper maker can control in order to get the desired dandy roll effect.

A steam shower inside the roll is often used in addition to the water shower for more efficient cleaning, especially when there is pitch in the stock. The steam shower is directed against the roll just above the outgoing nip and is said to help in separating the roll from the sheet if directed properly. Dripping of water or condensate inside the roll must be avoided.

When a pattern of lines is desired in the sheet, the dandy roll is wound with wires outside the cover. The resulting paper is referred to as "laid paper". Watermarks are produced by the pressing of patterns into the surface of the sheet, which should be so wet that fibers are redistributed during this pressing. The patterns may be made from fine wire and soldered on to the surface of the dandy roll. A more advanced technique is to produce dies by photochemical processes and to press the wire cloth between these dies. In the latter case so called light-and-shade watermarks are obtained. The pattern will produce not only lighter but also heavier areas. The production of clear, distinct watermarks of this type calls for great skill and can truly be referred to as an art.

On medium speed machines, the compacting of the sheet, improved formation and flatter top surface are the important benefits of dandy roll operation. In some cases, the dandy roll will result in about one inch higher couch vacuum, which is likely to affect dryness and wet strength at the couch favorably. With increasing wire speed, however, the effect of the dandy roll decreases, partly because of shorter pressing time, while operating troubles are apt to increase. One of the latter is the spraying of water from the roll, which causes splash marks in the paper, and is especially noticeable in areas of wet streaks. Picking becomes a more serious problem as does the drag between dandy roll and wire.

Even at 1,000 f.p.m. it may be difficult to justify the use of a dandy roll and on high speed newsprint and kraft machines dandy rolls are not at present time practical.

The successful use lately of top wires (Inverform)* which dewater the sheet in the same way as the dandy roll and are capable of very high speed, may be taken as an indication that the conception of the dandy roll still offers possibilities for technical development.

Flatbox Design

The conventional flatbox is a 10-inch wide trough with a slotted or perforated wooden cover and an outlet at one or both ends. The box must not deflect more than couch and table rolls and must not vibrate. It should be corrosion free and easy to keep clean, both outside and inside. The box must be deep enough to ensure free air space below the cover and the outlets must be adequately sized. These conditions are not always met on old flatboxes which may have been designed for a far lower production that the actual one. For the proper dimensioning of flatboxes and drop-legs the reader is referred to TAPPI Data Sheet No. 10.

Flatbox Covers

The most common cover is made from end of grain hardwood—usually maple. The wood is often wax impregnated, which is claimed to give less wear and smoother surface. The covers are generally perforated although sometimes slotted covers are used on the first one or two flat boxes in order to accommodate the larger flow of water into these "wet boxes". The slots or holes may be sloped at a moderate angle in the direction of flow—a feature that could be expected to facilitate the drainage of water from the wire. Recent model experiments **(9)**, however, indicate that the best angle and even direction of slope has to be determined from case to case by experiments. The best size and pattern of holes are also open questions. It appears in general that slope, size, shape and pattern of holes are factors of considerable importance to flatbox performance, which deserve a closer study than they have received.

Wax impregnated end of grain maple covers are quite satisfactory but are not available everywhere and much effort has been given to finding a good synthetic substitute **(10)**. The problem is to find a material that wears down slowly (low material wear) and does not wear the wire (low wire wear). The coefficient of friction between wire and flatbox cover must also be low. It has been found that these three factors—coefficient of friction, material wear and wire wear—are mutually independent. To make things even more complicated, they also change differently when grit comes into the system. Grit in headbox stock is a problem in all mills using groundwood pulp. The most damaging grit is the very hard silicon carbide particles produced by the sharpening of ceramic stones. Grit, however, also comes into paper mills with the water, the wood, the pulp and the filler. If grit particles are caught by and embedded into the flatbox covers, wire wear may increase manyfold. The resulting scratches on the knuckles of the wire are easily seen under a microscope. Materials too hard to pick up grit, for example metals, are — unfortunately — also

*See Paper Trade Journal, June 22, 1959.

likely to wear the wire themselves. Very soft materials embed and smear over the grit particles but are, in the process, rapidly worn down themselves. The ideal cover should combine softness and resilience so that grit particles can be accommodated between cover and wire without either being forced too strongly into the wire or becoming fixed to the cover.

Pye's investigation (10) showed end of grain fine weave laminates to be comparatively wear resistant with a coefficient of friction about half that of maple covers. Rubber covers of suitable hardness wore far less than laminates but had rather high coefficients of friction. Nylon gave highly satisfactory results in all respects tested but may pose other problems, for example those of resurfacing and swelling in water. Lately, reinforced plastic covers with a thin cover of Teflon have proved remarkably successful. Another interesting new approach is offered by a slotted cover built up from strips of rubber each having an expandable ridge of very soft rubber running along the center of the top surface. One advantage claimed by this design is an excellent seal against the wire. Flat grain laminates are not recommended—mainly because of the rough surface caused by the fabric when exposed.

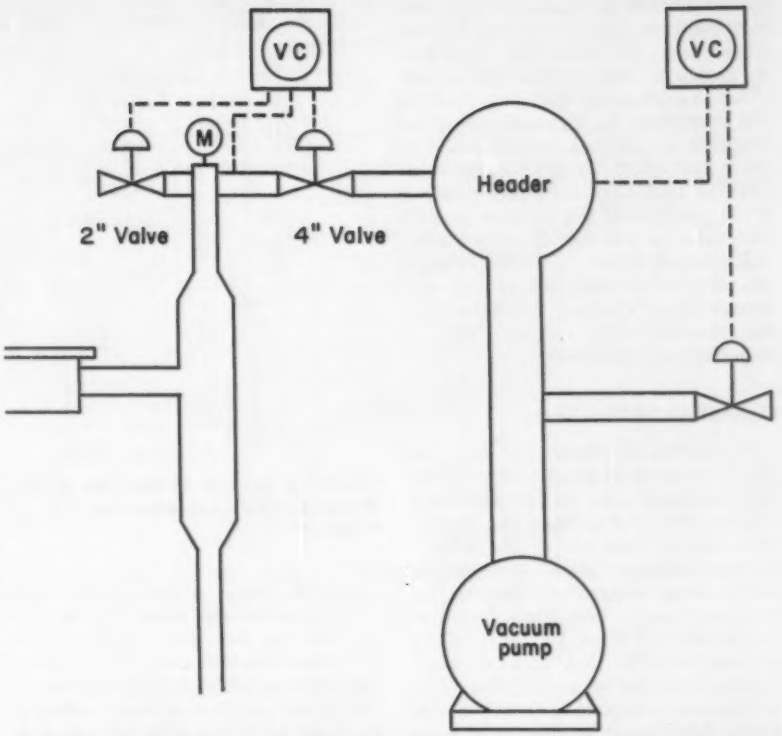


FIGURE 3. FLATBOX VACUUM CONTROL SYSTEM featuring conventional pressure controllers.

Vacuum Systems

The flatbox outlets are connected via water separators to droplegs, which go down into a sealpit in the basement, and the separators are evacuated by a vacuum pump. Actually, most of the vacuum desired can be produced by the action of the droplegs provided these are correctly dimensioned. (Tappi Data Sheet 10 gives some rules of thumb for diameters of droplegs). In practice, the droplegs are generally found to be grossly overdimensioned, which reduces their function to that of water seals.

The vacuum in each separator is controlled by a valve connecting the separator to a common vacuum header. Manual setting of this valve is common but not entirely satisfactory. Figure 3 shows an automatic control system which maintains constant vacuum in the header and in each separator by either sucking out or letting in air. Of course, this means having a rather expensive control instrument for each flatbox. On the other hand, the vacuum can be controlled within 0.1" Hg. Figure 4 shows a simpler mechanical control valve, the Broughton valve, used to maintain constant vacuum in flatbox separators. A number of other more or less ingenious designs have appeared, but none has become very widely used.

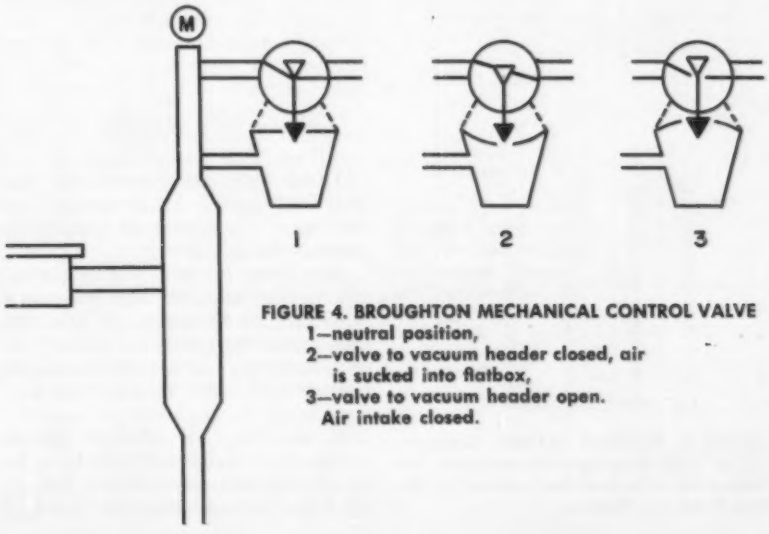


FIGURE 4. BROUGHTON MECHANICAL CONTROL VALVE
1—neutral position,
2—valve to vacuum header closed, air is sucked into flatbox,
3—valve to vacuum header open. Air intake closed.

Sometimes all flatboxes drain into a common separator with only one large dropleg. This is not a very satisfactory method since vacuum on the boxes has to be controlled by throttling of valves on the flatbox outlets with risk of flooding flatboxes and causing uneven suction across the machine. Other disadvantages of this system are that the flow from each box cannot be measured separately and that white water from wet and dry boxes cannot be separated. The extra expense of separate droplegs is therefore well justified.

The disadvantages mentioned above are also inherent in the Poirier

system shown in Figure 5. The system features a number of small droplegs from the common separator so arranged that they are filled one after the other as the level rises in the separator. As a consequence, the droplegs in operation will work at their maximum capacity, and it is claimed that they can thus produce 80-90 per cent of the vacuum needed. The vacuum will also be very stable.

Figure 6 shows a flatbox sealpit which enables easy measuring and separation of the flows from the various droplegs. The sealpit level is automatically controlled.

Operation of Flatboxes

Conventional flatboxes are installed at a point on the wire, where the table rolls no longer efficiently remove water. The flatboxes remove more water than table rolls above a certain "critical" sheet dryness due to the vacuum applied. The friction between flatbox and wire, however, puts a limit of about 10 inches on the vacuum feasible. The "critical" sheet dryness for flatboxes (of the order of 2 per cent is an important design figure for a paper machine, and some rules of thumb for calculating it from wire speed, roll diameter and freeness would be most valuable but are not known to the author. On a paper machine in operation, however, it is relatively easy to measure the rate of drainage from the last table roll and from the first flatbox and to make the changes indicated (if the drainage capacity is inadequate).

Machine investigations have been reported to the effect that flatboxes should be installed side by side with no airspace between in order to obtain maximum efficiency **(11)**. Apparently, water is sucked back into the sheet from the wire meshes if the vacuum is broken between the boxes, which will hamper water removal and increase flat box friction. The number of flatboxes generally varies from 5 to 10. Where a dandy roll is used, two flatboxes are installed ahead of it. These latter boxes must not increase sheet dryness above the point where picking starts on the dandy roll.

Proper levelling and positioning of the boxes is the first prerequisite for good functioning. If one of them is the least too high or too low the rate of wire wear will increase and the vacuum will fluctuate erratically on one or several boxes. If the boxes are not absolutely perpendicular to the machine direction they will tend to carry the wire towards one side.

It is usual to oscillate the flatboxes slowly in order to prevent the wire from grooving the cover. If, because of grooves, the wire should freeze in a fixed position over the flatboxes, the wire is bound to fail very soon. There are perhaps a dozen different ways of achieving this wire oscillation, but the problem is so simple mechanically that no description is justified. It is advisable to check, however, that the oscillation has no vertical component, as can be the case on old and worn installations, since this can have a highly deleterious effect.

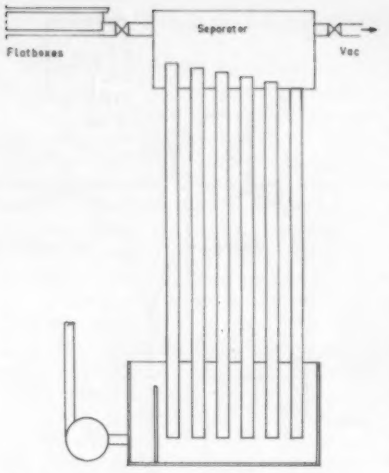


FIGURE 5. POIRIER SYSTEM for flatbox drainage. Common separator for all flatboxes.

Flatbox oscillation is really not an attractive practice from an engineering standpoint. A far better alternative is to oscillate the wire guide. A wire guide is nowadays always used anyway, and little extra complication is involved in oscillating the impulse device.

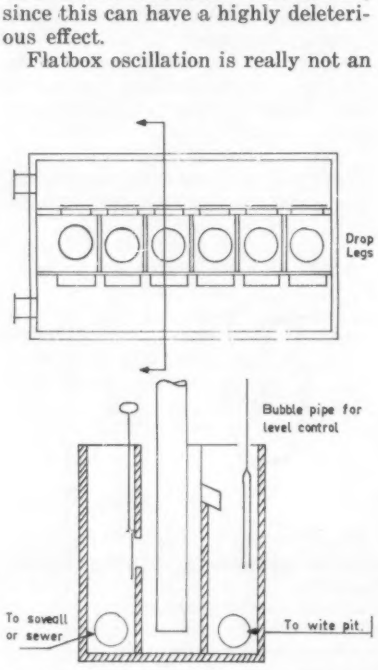


FIGURE 6. FLATBOX SEALPIT. Separate pit for each dropleg with provisions for measuring overflow and sewering the flow from any flatbox.

Vacuum Regulation

The boxes should carry a gradually increasing vacuum from the first "wet" box to the last "dry" box, which is best achieved by maintaining different vacuum in each flatbox separator (which, of course, calls for separate droplegs).

The importance of gradually increasing vacuum is generally acknowledged. It has also been proved experimentally **(4)** that increasing vacuum gives higher sheet dryness than a corresponding equal vacuum on all boxes **(12) (16)**, the sum of the vacuum readings being the same in both cases. The first case is also likely to result in less wire drag.

It has been claimed that a high vacuum on the wet boxes has little effect on drainage since already a low vacuum suffices to empty the large capillaries in the time available **(13) (15)**. From theoretical considerations it is deduced that the pressure differential needed to drain a capillary filled with water is

$$\Delta p = \frac{2\alpha - r \cdot 1 \cdot \varsigma \cdot g}{r}$$ where

α = surface tension of water
r = radius of capillary
l = length of capillary
ς = specific gravity of water
g = acceleration of gravity

It is also concluded that the time needed to empty a capillary must be:

$$t = \frac{8 \cdot \vartheta \, l^2}{r^2 \cdot \Delta p}$$ where

ϑ = viscosity of water

These formulas demonstrate that it is inefficient to try to empty large and small capillaries by use of the same pressure difference.

The formulas also indicate what effect machine speed and box width will have on drainage. A fast machine apparently calls for higher flatbox vacuums. Also wide boxes can operate with lower vacuum than narrow boxes.

Müller-Rid (15) studied flatbox drainage by model experiments in the laboratory and summarized his results in graphs of the type shown in

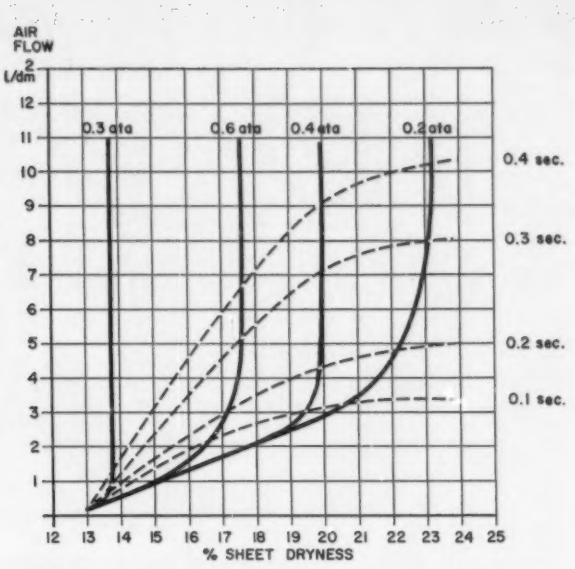


FIGURE 7. AIR FLOW as a function of sheet dryness at constant basis weight and freeness. By courtesy of Dr. W. Muller-Rid.

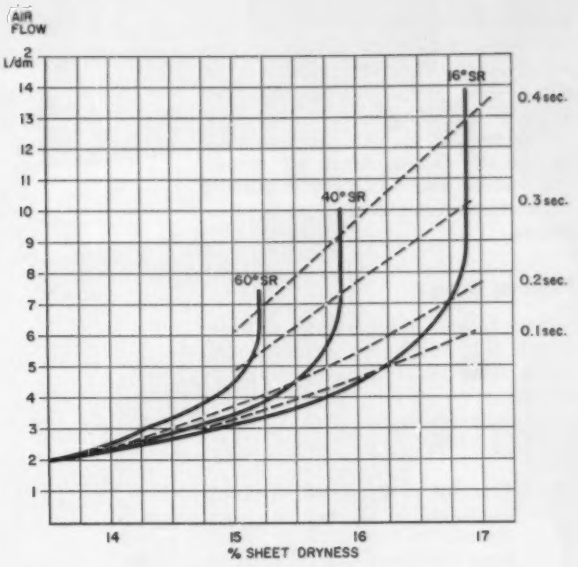


FIGURE 8. AIR FLOW as a function of sheet dryness at constant basis weight and vacuum. By courtesy of Dr. W. Muller-Rid.

Figure 7. In his experiments he worked with three independent variables: suction time, vacuum and stock freeness, which determine the two dependent variables: sheet dryness after the flatboxes and air sucked through the sheet over the boxes. Figure 7 shows the results for a certain sheet of known basis weight and freeness. It can be seen that in this particular case an increase of the vacuum from 0.6 to 0.2 data had no effect on sheet dryness below 12 per cent dryness, which confirms what was stated earlier about the vacuum on the wet boxes. It is also seen that in this case an increase of the suction time above 0.2 seconds had very little effect on dryness at any vacuum. Figure 8 gives a similar presentation of the effect of freeness at a given vacuum. Apparently, freeness, too, has little effect at the wet boxes. The effect of basis weight, finally, was found to be as shown in Figure 9. Sheet dryness first increased rapidly with the basis weight, passed through a maximum and then decreased slowly. The effect of vacuum was comparatively low at very high or low basis weights. The shape and level of such curves differ with the pulp quality and Dr. Müller-Rid ascribed this mainly to the porosity of the wet sheet — a property that so far eludes evaluation.

When the dryness of the sheet reaches about seven per cent, air starts passing through the capillaries of the sheet into the vacuum box. Figures 7-9 demonstrate how this airflow increases with time and sheet dryness. It is seen that the sucking of excessive volumes of air through the sheet has very little effect on sheet dryness. It is therefore desirable that—as soon as this drainage limit has been reached—the sheet should pass on to a new box with higher vacuum. Some capillaries which were earlier too small to be emptied will then be drained and sheet dryness will again increase. The vacuum should be controlled to avoid larger discrepancies in the flow of water from the different boxes and the width of the boxes should be such that excessive volumes of air are not sucked through. Still, the flat box system has to be dimensioned with appreciable margin both because of the varying demand put on it and because of the often appreciable short term fluctuations of basis weight. The latter disturbance manifests itself in a fluttering of the dry line above the flatboxes, which can be observed on almost every paper machine. If the dry boxes are unable to stop a momentarily advancing dryline, wet streaks may reach as far as the couch and even affect sheet dryness after the couch in a way liable to cause breaks.

Left to itself the vacuum tends to rise in the flatbox when the sheet covering it becomes wetter and this automatically levels out moisture variations after the boxes. Such

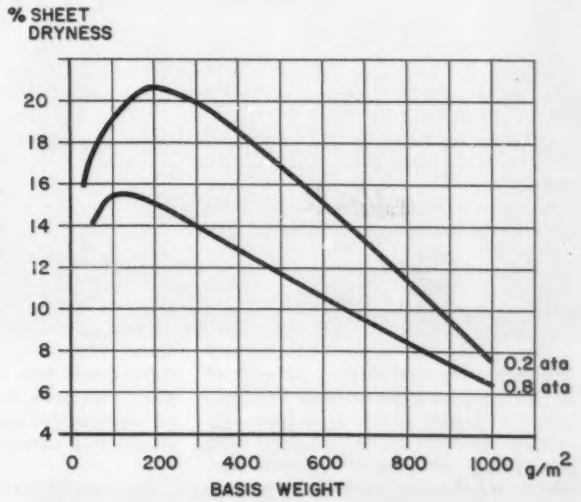


FIGURE 9. SHEET DRYNESS as a function of basis weight at constant freeness and suction time. By courtesy of Dr. W. Muller-Rid.

vacuum variations, however, are apt to cause draw variations at the couch because of their effect on the couch load, and it is therefore desirable to eliminate them by automatic control of vacuum especially on the dry boxes. After all, steady draw at the couch is more important than constant moisture after the flatboxes.

Flatbox Drag

The flatbox drag, which may account for 50-70 per cent of the coach load, can be described by the formula:

$$N = F \cdot V \cdot A$$

N = drag between flatbox and wire
F = coefficient of friction
V = vacuum in flatbox
A = total hole area of flatbox cover

The coefficient of friction as defined by this formula was found to vary from 0.19 to 0.35 for end of grain maple covers. **(14)** Coefficients for other materials are reported by Pye **(10)**. The coefficient of friction was found to increase as the pressure per unit land area of the cover dropped, this factor explaining most of the spread in the values found for the maple covers. The implication would be that covers should have a high percentage open area for minimum wear. **(10)** No explanation is offered by the investigators, but it seems reasonable that close spacing of the holes gives better water lubrication of the land areas.

The flatbox drag is a very important factor in the running of a papermachine. If it can be reduced, the results will be less couch load, more steady couch draw, higher wire tension at the breast roll and therefore better sheet formation but, above all, longer wire life.

It now appears that many things can be done to reduce wire drag at reasonable cost and it seems, therefore, advisable to provide means on the papermachines for checking of drag and drainage on each flatbox and to keep a running record of these data. Drag may be measured with strain gauges on the flatbox supports.

Moving Belt Flatboxes

The problems caused by friction between wire and flatbox cover lead to the design of the moving belt flatbox, which now exists in at least two makes. It consists in principle of a perforated or slotted rubber mat which rotates with the wire across the tops of a number of narrow flatboxes. The advantages claimed are that the wire wear is practically eliminated, that couch power is reduced by 30-50 percent and that very high vacuums—up to 22 inches Hg—can be used. As a matter of fact, the consensus seems to be that wire life is doubled by substituting moving belt boxes for stationary boxes. Only the dry boxes need be replaced, however. There is no point in using the rather heavy and complicated moving belt boxes as wet boxes unless the drainage capacity of the wire is inadequate. One ordinary flatbox is recommended between the dandy roll and the moving belt box.

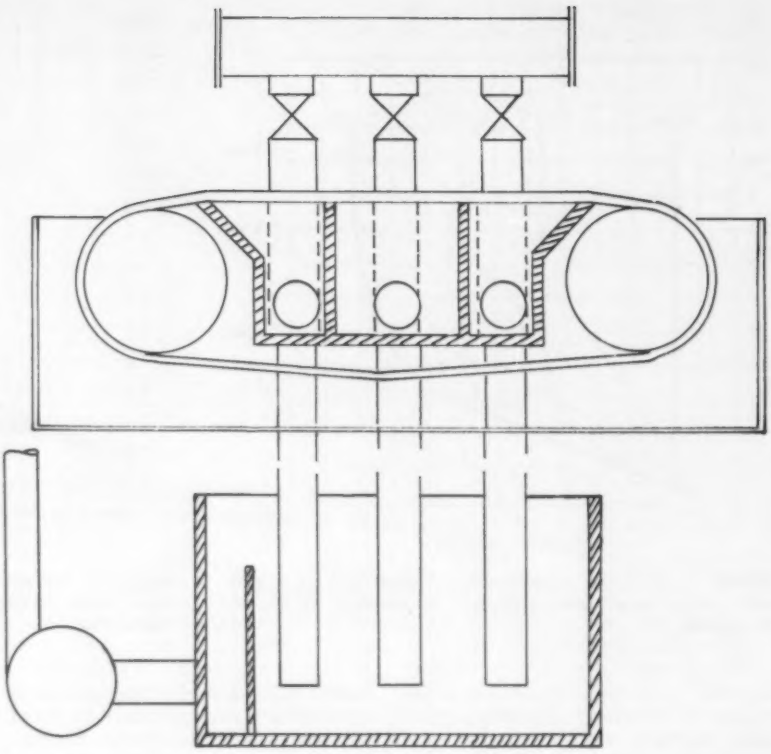


FIGURE 10. MOVING BELT FLATBOX.

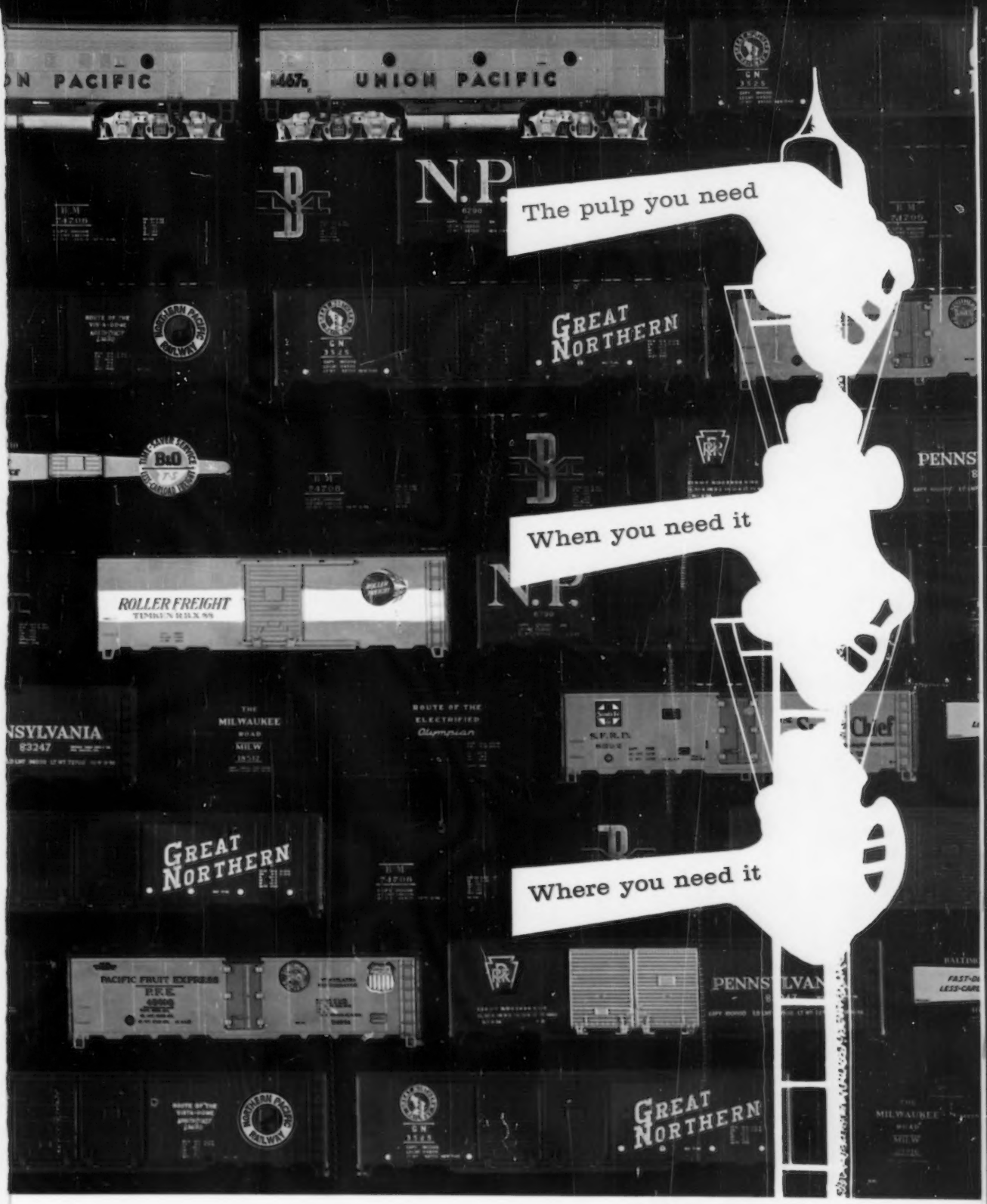
The moving belt flatboxes now in operation are known to be sturdy and dependable. The Neoprene belts last more than one year—as a matter of fact, belt life does not appear to be a matter of great concern. The maximum speed possible with this type of box is not exactly known. Speeds above 1700 f.p.m. are reported.* It may be anticipated that at a certain speed the centrifugal force on the rubber mat will interfere with operation, but here it is safest not to rely on theoretical speculations but on actual mill experience. As speed increases more of the water sucked out of the sheet will be thrown out of the holes of the rubber mat and collected in the tray underneath it. This process, however, does not appear to present any problem. On the question of sheet dryness all sources available are vague. It appears that the moving belt box removes as much water as an equal length of flatboxes but not appreciably more. At high machine speed a problem will be posed by the large quantities of air "pumped" into the vacuum system by the holes of the rubber mat. The Nash pumps have to be designed to handle this air as well as the air sucked in through the sheet. A possible way out might be to fill the holes with low pressure steam just before the mat meets the wire. This steam will condense in the vacuum boxes and will cause no extra load on the vacuum pumps.

At high machine speed the belt can be driven, but this does not seem to be necessary at today's speeds.

As far as sheet quality, e.g. two-sidedness, shadow marking, is concerned there seems to be no major difference between the two types of boxes.

The moving belt box has been on the market since before the war but

*See Paper Trade Journal, May 2, 1960.



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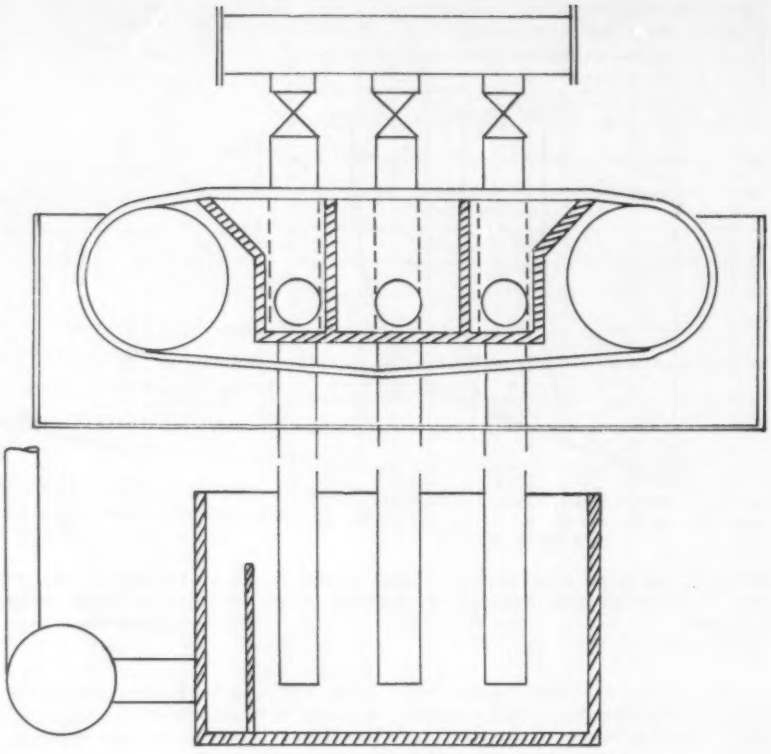

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it did not come into more general use on big paper machines until the late fifties. It will generally pay for itself in reduced wire cost alone in less than two years.

New Developments

There are on the market a number of modified flatboxes designed to replace table rolls. They feature a low vacuum obtained by a short drop leg and/or a fan. The wire may be supported inside the box by rollers, regular table rolls or a number of strips, usually of laminated plastic. None of these devices has reached a state of development that would justify a closer presentation. It is likely, however, that a design will eventually crystallize that will replace the table rolls in filling the gap between the forming board and the flatboxes.

On paper machines where production is limited by the drainage on the wire, steam showers placed above the flatboxes have been found to allow further increase of machine speed. The explanations are lower viscosity of the water in the sheet and less air sucked into the flatboxes. The effectiveness of the method, consequently, depends on the sheet temperature ahead of the flatboxes and the capacity of the vacuum pumps. Where the white water temperature is high and the vacuum capacity ample little or no improvement can be expected from the method. It is believed, however, that many old paper machines could use the method to advantage.

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Canadians Renew World Newsprint Picture

In 1960 world demand for newsprint is establishing new records and all major areas of the world are sharing in the gain, according to the latest annual review by the Newsprint Association of Canada. There is, however, considerable variation in growth rates and the survey, "Newsprint Data: 1960," points out the faster growth which is now occurring overseas than in North America.

In contrast to 1959, demand shows greater increases than capacity in 1960 and world production represents about 88 per cent of capacity compared with 84 per cent last year. Key factors in the outlook for 1961 are the increase of capacity now under construction in Scandinavia and a temporary pause in the United States consumption growth coincident with the current stage of the economic cycle. Their combined effect is such that a world average operating rate of about 86 per cent is suggested for next year.

The survey includes a chart and table of seasonally adjusted U. S. consumption rates which show a temporary decline starting last June. If maintained it suggests slightly lower consumption in 1961 than the record 7.4 million tons expected for 1960.

Canadian mills' production for 1960 is expected to show an increase over 1959 of about 341,000 tons or 5.3 per cent and average operating rate for the year will be about 88.5 per cent compared with 85.0 last year. According to the report, "This is the largest annual increase since 1947 and a new production record about 4.1 per cent more than the previous record of 1956."

For 1961, however, a temporary decline of about 2 per cent is suggested, largely because of the indicated cyclical fluctuation in the United States demand. Canadian capacity for 1961 is virtually unchanged and an average operating rate of about 87.1 per cent would result.

The total amount of "stand-by" capacity in Canada for 1961 appears to be almost a million tons, a reduction from the 1958 peak when it was nearly 1,150,000 tons. The report notes that in the future no repetition of the long postwar period of constant operation at full capacity is foreseen. Growth of capacity in Canada and elsewhere is expected to precede anticipated growth in demand, thus maintaining a margin of "stand-by" capacity available in case of need.

The survey includes comparisons of capacity growth in Canada with other areas of the world, showing the greater rates but smaller volume elsewhere. It points out the very rapid increases recently achieved in the United States and Scandinavia, each of which has added about a million tons in the last five years. Also shown are capacity increases by region in Canada and in the United States, emphasizing the greater growth rates of the Canadian West and the Southern States.

As in previous years, this survey presents a complete world statistical review with charts and tables, also individual data country by country. It concludes with a list of new capacity projects and prospects all over the world.

Paper Trade Journal — Volume 144 – Year 1960
Index to Feature Articles

(Short items and news stories not included)

	Page	Date
Alkaline Pulping (kraft & soda)		
Alkaline Digester Maintenance Using Stainless Steel Overlay—Peter G. Zouck	33	Oct. 31
Attaining Steady Service from Your Electrostatic Precipitator—S. Rabkin, and P. B. Crommelin	48	Apr. 18
Black Liquor Evaporators Require Optimum Tube Cleanliness—Jack N. Brown and George Kleinman	48	Mar. 14
Capital Cost Estimate for a Kraft Pulp Mill	63	Apr. 11
Continuity of Lime Kiln Operation Through Maintenance Control — Bernardo Alonso	36	Jan. 11
Kraft Pulping with Polysulphides Results in "Unprecedented" Yields	39	Oct. 3
Kraft Pulping of Sawdust and Shavings in a Pandia Digester	28	Jul. 4
Refining Said Key to High Yield Kraft	62	Sept. 12
Tall Oil Fatty Acid Production Has Zoomed	33	Dec. 19
Bleaching		
Automatic Continuous Production of Hypochlorite Bleach Liquor at St. Helens — P. M. Schnable and E. P. Duncan	40	May 2
How Gaspesia Achieved Tops in Bleached Sulphite Pulp Production—John C. W. Evans	30	Nov. 28
How to Plan a Better Bleach Plant Maintenance Program—Norman Baldwin	34	Dec. 19
Mead Now Bleaches Hardwood Soda Pulp with Chlorine Dioxide — Ernest F. Barker	24	Feb. 29
New Design of ClO_2 Bleach Tower Cuts Costs at Potlatch—Paul D. Van Derveer	20	Aug. 8
"Quintuplets" Help Nekoosa - Edwards Generate Chlorine Dioxide	52	Sept. 12
Swedish Mill Bleaches Sulphite Pulp with Chlorine Dioxide—Per Svanberg	28	Jul. 25
St. Regis Adds Zinc-Hydro Stage to Peroxide Bleach Plant—Harry Dyer	34	Apr. 18
Paperboard Manufacture		
Albany Felt Holds Technical Meeting for Paperboard Men	37	Feb. 22
Automatic Tension Release Jack Saves Felts	51	Oct. 3
Continuous Felt Washing — A Growing Trend—Lawrence H. Brown	38	Jan. 18
How a Corrosion Problem in a Dryer Condensate System was Solved—Hugh E. Carr	42	Mar. 21
How to Improve Felt Performance when Using Wet Strength Resins—Ralph N. Prince	43	Apr. 4
How International Makes Bleached Kraft Paper and Board—J. E. Pate and Guy J. Bobin	20	Jan. 4
Major Modifications at Demopolis Permit Bleached Board Manufacture—John C. W. Evans	36	Mar. 21
New Eight Cylinder Wet End Installed in Record Time by Bestwall — Paul D. Van Derveer	20	Aug. 29
New "Milo Film" Starches Reduce Cost, Improve Quality of Size and Coatings —Jack Weaver	30	Mar. 28
New Needled Papermakers Felts Offer Advantages to our Industry—James E. Smith	50	May 16
Owens-Illinois Starts New Machine for Corrugating Medium — Paul D. Van Derveer	36	Mar. 14
Progress Report on Mill Experience with Needled Felts—James E. Smith	40	Nov. 7
Putting a Number on Hair Shedding—L. G. Ward	42	Apr. 18
Coating		
Clean! Is How You Should Keep Your Size Press—Wayne T. Crannell	29	Aug. 22
Europe's Largest Off-Machine Coater Begins Production	24	Feb. 1
How Ozalid Coats Paper with Sensitizing Solution	34	Jul. 18
High Quality Metalized Paper Demands Specialized Techniques — Fred B. Shaw	46	Oct. 3
International Paper Installs World's Largest Unwind-Splicer	23	Mar. 28
New Developments in Coating Further Complicate Selection of Method Used —Alexander F. Bobreski	30	Jul. 4
New "Milo Film" Starches Reduce Cost, Improve Quality of Size and Coatings —Jack Weaver	30	Mar. 28
New Process Applies Polyethylene Solution to Paper—William Mullen	35	Aug. 8
Converting Operations		
Folding Box Manufacture Progressed in 1959 . . . Outlook Good for 1960	28	Feb. 1
It's Simple to Make Special Adhesives for Special Bags—George Richmond and Clyde D. Woodburn	30	Jan. 25
Long Term Outlook for Corrugated Container Demand—Peter W. Hoguet	43	Jun. 27
What's Wrong with Paper for Business Forms—Quentin C. Schwake	43	Jan. 11
Engineering		
A New Approach to Roll Crowning—Particularly for Calenders—Howard E. Kuehn	36	Jul. 18
Determining Minimum Chest Levels for Continuous Pumping Applications—P. J. Olmstead	30	Feb. 29

Modern Methods of Mechanical Pulp Manufacture

This book comprehensively covers all aspects of groundwood pulp production. The author, K. H. Klemm, has a broad knowledge of groundwood manufacturing methods and has been associated with groundwood mills on both sides of the Atlantic. Price: $5.00.

CONTENTS

The Raw Material: Wood

Heterogeneity of Wood 8
Effect of Pulpwood Quality 17
Pulpwood Transportation to the Mill and Wood Storage Methods 27
Wood Handling Within the Mill 33
Removing the Bark from Pulpwood 38
Barking Methods and Bark Disposal 45
Modern Woodyard Systems 56

The Groundwood Mill

Theoretical Aspects of Production 63
Factors Influencing Grinder Capacity 71
Modern Grinder Types 75
Stones and Stone Handling 87
Grinder Drives and Governors 97
Coarse Screening and Rejects Recovery 102
Grinder Room Arrangement 106
Mill Manpower Requirements 108
Problems of Groundwood Quality 111
Routine Testing and Control Methods 114
Instrumentation in a Groundwood Mill 121
Grinder Control 125
Control and Record Keeping 138

Groundwood Stock Preparation

White Water Systems 144
Screening Methods and Principles 151
Modern Equipment for Screening 174
Theoretical Considerations of Screening Systems 183
Thickening 190
Bleaching 202
Stock Chest and Storage Systems 212
Fraction Mixing Process 217
Groundwood from Steamed Wood Blocks 220
Chemical Treatment Processes 223
Mechanical Pulp from Disk Refiners 229
Comparison of Groundwood Pulps 234

Closing Remarks

Economic Importance, Main Properties, and Uses of Groundwood 237

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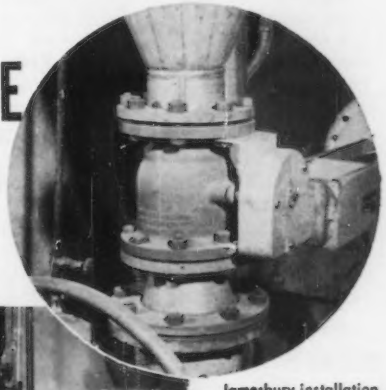
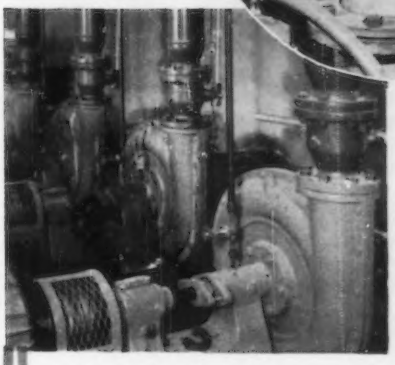


Jamesbury installation at Weyerhaeuser Longview Plant



Jamesbury installation at Mead Corporation Chillicothe Plant

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	Page	Date
Engineered Economy Featured in Celgar's Recovery and Steam Plants	38	Dec. 19
Engineers Reveal Data on New Developments—Paul D. Van Derveer	44	Nov. 7
How to Solve Stock Pumping Problems Ahead of Time—A. E. Risk	41	Jun. 13
How to Use Stowe-Woodward Nip and Crown Test Method—Warren Stubblebine	45	Nov. 21
Hughe Bark Press at Scott Saves Large Quantities of Fuel Oil—E. F. Barker	46	May 9
Many Benefits Gained from Conversion of Open Hood to Closed	41	Mar. 14
New Simplified Method to Check Roll Nip and Crown	29	Aug. 29
28-Ton Metal Stack, 125 Feet High Creates Unusual Erection Problem—P. W. Davis	28	Oct. 31
What's New in the Design of Groundwood Mills—A. P. Schnyder	62	Dec. 5
Which of the Three Possible Kinds of Stock Chest Agitation to Use	50	Feb. 15
Wide Variation Shown in Corrosion Resistance of Polyester Resins	35	Jun. 27

Finishing

Bleached Board Finishing Operations Need a Fresh Look—J. W. Robinson	42	Oct. 17
Digital Computers Can Help Planning and Scheduling for Better Finishing	41	Jun. 20
Examining the Cost of Each Stage of the Finishing Operation	40	Apr. 18
How the Eldema Electronic Paper Sorting Machine Operates—Claude J. Rinfret	32	Oct. 24
How the Synchro-Fly Cutter Works ——Thomas S. Greiner	34	Aug. 1
How to Operate a Supercalender—Particularly on Coated Papers—Francis E. Schiller	28	Sept. 5
How Sales Operations Can Improve Finishing Efficiency	48	Jun. 13
Improved Scheduling Methods Can Increase Operating Efficiency in Finishing	40	Apr. 4
Let's Raise the Finishing Superintendent From Low Man on the Totem Pole	28	May 30
Main Concern of the Modern Supercalender Is Its Filled Rolls—Eric B. Norman	59	Apr. 11
Narrow Aisle Trucks Solve Paper Handling Storage Problems — Henry J. Roehner	53	Nov. 7
"One-Man" Unstacker Cuts Trimming Costs	49	May 16
Preventing Costly Downtime on Today's "Assembly Line" Trimmer—William R. Frazier	45	Mar. 21
Quality Control with Broke Reduction Offers Savings in Fine Paper Finishing	39	Apr. 25
Some Definite Improvements in a Mill's Finishing Operations—A. P. Perrin, Jr.	24	Jul. 25
Some Questions on Finished Paper Warehouse Requirements	27	Jul. 4
Supercalendering Coated Papers in One of the Most Important Finishing Operations—Francis E. Schiller	24	Aug. 22
Surge Area Requirements are a Vital Factor in Finishing Room Layout	46	Apr. 11
The Pursuit of Finishing—Leslie S. Pearson	24	Mar. 28
Unique Automatic Roll Handling System in Operation at St. Joe Paper Co.—Paul D. Van Derveer	28	Aug. 1
Urgent Need for Development of New Automatic Precision Finishing Equipment	33	May 23
West Virginia Installs Radically New Sheet Cutter at Covington	32	Aug. 1
What are Finished Paper Warehouse Requirements for a Fine Paper Mill?	50	May 9

Forecasts and Industry Growth

Forecasts Gain in Waste Paper Utilization This Year—Peter W. Hoguet	41	Mar. 21
Future Paper and Board Production and Pulpwood and Water Requirements	50	Jul. 11
Industry Major Expansion Projects	40	Oct. 3
Some Problems of our Industry and What Should be Done About Them—Howard E. Whitaker	30	Oct. 31
What are the Trends of Soviet Foreign Trade in Pulp and Paper—W. Donald Bowles	40	Sept. 19
Outlook for Market Pulp Here and Abroad—John C. W. Evans	24	Sept. 5
Paperboard Economics Prospects — Very Good for 1961	59	Dec. 5
Will the Russians Overtake the U. S. Pulp & Paper Industry?—E. G. Lagerloef	38	Mar. 7
World Newsprint Supply—Demand Outlook Through 1961	50	Jun. 20

Instrumentation

Caliper Profiler Used as Control Instrument at W. Va. Mill—N. A. Ciannamea	36	Apr. 25
Digital Computers Can Help Planning and Scheduling for Better Finishing	41	Jun. 20
Future of Electronic Instrumentation in the Pulp and Paper Industry — Edgar Andrews	30	Aug. 8
How Eldema Electronic Paper Sorting Machine Operates — Claude J. Rinfret	32	Oct. 24
How to Improve Roll Condition for Web Offset Printing—Arden Dubert	42	Oct. 10
Instrument Measures Distortion of Paper Due to Humidity	35	Mar. 21
N. Y. and Penn Centralizes Testing and Quality Control Lab.	34	Mar. 28
Process Instrumentation for Continuous Refining—R. F. Barber	24	Oct. 31

Maintenance

Air Compressors are Reliable Machines—How to Keep Them That Way—Charles W. Gibbs	42	May 2
Alkaline Digester Maintenance Using Stainless Steel Overlay—Peter G. Zouck	33	Oct. 31
Attaining Steady Service from Your Electrostatic Precipitator — S. Rabkin and P. B. Crommelin	48	Apr. 18
Black Liquor Evaporators Require Optimum Tube Cleanliness—Jack N. Brown and George Kleinman	48	Mar. 14
Care in Operation Key to Maintenance of Modern Pulpstones — James H. Perry and William H. Copeland	30	Feb. 22
Care of Rubber Covered Rolls — R. M. Leighton	32	Feb. 29

	Page	Date
Chimney Design and Upkeep—How and Why of it—E. H. MacDermott	31	Jul. 25
Clean! Is What you Should Keep Your Size Press—Wayne T. Crannell	29	Aug. 22
Continuity of Lime Kiln Operation Through Maintenance Control — Bernardo Alonso	36	Jan. 11
Cutting Maintenance Costs in the Refining of Groundwood Rejects—R. B. Collier	24	Jan. 25
Fallacy For Grinder Motors is Neglect; Fact is Periodic Inspection — William M. Gue	26	Aug. 29
How a Corrosion Problem in a Dryer Condensate System was Solved—Hugh E. Carr	42	Mar. 21
Getting the Best Performance from Your V-Belt Drives—A. E. Poehlmann	30	May 30
How to Cut Lubrication Costs—Meet all Needs with Only Ten Lubricants — Bruce M. Dunham	44	Oct. 24
How to Get and Keep Good Doctoring—James K. Gardner, Jr.	46	Nov. 14
How to Keep Getting Maximum Quality High-Yield Pulp from Disk Refiners—David Sharp	46	Apr. 4
How to Plan a Better Bleach Plant Maintenance Program—Norman Baldwin	34	Dec. 19
How UB-C Grinds Chipper Knives More Efficiently and Economically	45	Aug. 15
Installation Plus Bearing Lubrication Equals Long-Lived Vacuum Pumps—Irving H. Owen	40	Jun. 27
Installation and Maintenance Improve Screen Performance—M. P. Hahn	30	Feb. 1
Keeping Your Conical Refiner to Ripe Old Age with Less Time Out—Paul B. Stretch	46	Aug. 15
Know How, Spare Parts Mean Better Slitter and Winder Maintenance—Carson B. Cash	56	Sept. 12
Leather, Plastic and All-Synthetic Belts Require Special Maintenance Procedures	18	Jan. 4
Main Concern of the Modern Supercalender Is Its Filled Rolls — Eric B. Norman	59	Apr. 11
Maintenance of Paper Machine Drives Begins with Design and Installation—Herman A. Smith	40	Jan. 18
Preventing Costly Downtime on Today's "Assembly Line" Trimmer — William R. Frazier	45	Mar. 21
Proper Calender Roll Maintenance is Essential to Paper Quality—Franklin B. Joy	42	Nov. 21
Proper Chipper Knife Care Can Reduce Costs and Produce Better Chips — George Bevis	40	Dec. 5
Putting Electrical Industrial Trucks in the Proper Perspective — John A. Draxler	46	Jun. 6
Reducing Drum Barker Troubles Through Preventive Maintenance—Vincent Dawson	36	Dec. 12
"Rolling Modernization" Increases Production and Efficiency at Downingtown —George M. Wagner	26	Apr. 25
Six Basic Rules Still Exist in Caring for Today's Chipper—N. P. Wardwell	46	Jul. 18
Start Out Right By Installing that Conical Refiner Correctly—T. J. McGraw	48	Sept. 19
Ventilation Systems Offer Years of Service with Little Attention—C. H. Guischard	50	Jun. 13
Why Crankshafts Fail—W. E. Irwin	22	Jan. 25

Materials Handling (See wood handling)

Air Operated Horizontal Conveyor Has No Moving Parts	36	Aug. 29
Considerations for the Use of Belt Conveyors in the Woodyard — J. M. Shepard	20	Mar. 28
A Conveyor System with "A Mind of Its Own"—Paul D. Van Derveer	18	Dec. 26
Fifty Years of Hand Lift Trucks—Tim F. Moriarty	48	Jul. 11
Integrated Scrap Handling and Baling System at Owens Illinois Box Plant	54	May 16
Material Handling Economics of Unloading Pulpwood from Rail Cars—H. N. Bartley	36	Aug. 15
Materials Handling and the Materials Management Concept — Donald S. Adams	40	Mar. 7
Narrow Aisle Trucks Solve Paper Handling Storage Problems — Henry J. Roehner	53	Nov. 7
Putting Electrical Industrial Trucks in Proper Perspective — John A. Draxler	46	Jun. 6
Self Dumping Hoppers Simplify Housing at C. W. P & P Mill	37	Sept. 26
Some "Cost Cutters" in The Handling of Wet Lap Pulp—M. C. White	34	Aug. 8
Unique Automatic Roll Handling System in Operation at St. Joe Paper Co.—Paul D. Van Derveer	28	Aug. 1

Mechanical Pulping

Are You Obeying the Rules in **Your** Groundwood Mill	44	Oct. 17
Care in Operation Key to Maintenance of Modern Pulpstones — James H. Perry and William H. Copeland	30	Feb. 22
Cutting Maintenance Costs in the Refining of Groundwood Rejects—R. B. Collier	24	Jan. 25
Fallacy For Grinder Motors is Neglect; Fact Is Periodic Inspection — William M. Gue	26	Aug. 29
Flash Drying Yields Quality Plus Groundwood Pulp in Norway—Carl J. Peterson	44	Jun. 13
How Bure AB Stores Groundwood in "Agitator-Less" Towers	35	Aug. 1
Newsprint from Broadleaf Woods—J. N. Swartz	44	Oct. 10
Two Men, Eight Grinders Produce 280 Tons of Groundwood Daily	54	Sept. 12
What's New in the Design of Groundwood Mills—A. P. Schnyder	62	Dec. 5

Mill Descriptions (new & expansions)

ALP Starts Up Alaska's Newest MgO Sulphite Mill at Sitka—Harry Dyer	36	Feb. 15
American-Israeli Mill Expansion Includes Bleached Cornstalk Pulp	22	Jul. 4
Bowater's New Board Mill Marks New Venture in North America	20	Jul. 25
Calcasieu's "Do-It-Yourself" Approach to a Decade of Growth—E. F. Barker	36	Oct. 10
Canada's Newest Fine Paper Machine Starts Up In Cornwall	42	Mar. 14

	Page	Date
Celotex Starts up World's Most Automated Fiberboard Mill—Harry Dyer	30	Nov. 21
Eastern Completes Remodeling No. 2 Fine Paper Machine—Harry Dyer	28	May 23
Empaques de Carton Titan Continues Growth with Another Machine	30	Jun. 27
Engineered Economy Featured in Celgar's Recovery and Steam Plants	38	Dec. 19
Fraser Starts New Machine at Madawaska Bond Mill	36	Nov. 14
Frost White Ups Production 70 Per Cent With New Yankee Dryer	46	Sept. 19
G-P Dedicates New Paper Machine, Will Double Production	20	Aug. 22
Hammermill Completes $20 Million Expansion Program at Erie — H. W. Vance	26	Jan. 4
Highest Tonnage Machine in the World—Seminole Chief—Paul D. Van Derveer	32	Sept. 26
Interesting Technological Features of Japan's Pulp and Paper Industry—L. E. Eberhardt	34	Feb. 22
Italy's Latest NSSC Mill Utilizes Poplar Veneer Wastes — Flavio Frabetti and Stig Johansson	34	Feb. 29
J & J Rogers Co. Rebuilds Two Machines and Expands	22	Oct. 31
Major Modifications at Demopolis Permit Bleached Board Manufacture — John C. W. Evans	36	Mar. 21
Make Way for Byron Weston's New Fine Paper Machine—Paul D. Van Derveer	28	Dec. 19
Mead Now Bleaches Hardwood Soda Pulp with Chlorine Dioxide — Ernest F. Barker	24	Feb. 29
Mexico City's New Paperboard Mill Begins Production	42	Dec. 12
New Eight Cylinder Wet End Installed in Record Time by Bestwall—Paul D. Van Derveer	20	Aug. 29
New Marathon Board Machine Features Calender with Instant Crown Control—Paul D. Van Derveer	30	Oct. 17
New San Joaquin Mill Now in Full Operation	14	Dec. 26
Nicolet Pioneers Unique Equipment with New Glassine Paper Machine — Paul D. Van Derveer	38	May 9
Owens-Illinois Starts Up New Machine for Corrugating Medium — Paul D. Van Derveer	36	Mar. 14
Scott Reveals Details of Mobile Tissue Operation — Paul D. Van Derveer	20	Nov. 28
St. Regis Adds Zinc — Hydro Stage to Peroxide Bleach Plant—Harry Dyer	34	Apr. 18
Unique Automatic Roll Handling System in Operation at St. Joe Paper Co. — Paul D. Van Derveer	28	Aug. 1
Western Canada's First Fine Paper Mill —John C. W. Evans	38	Sept. 26
World's Largest Kraft Pulp and Paper Mill Keeps on Growing—Paul D. Van Derveer	40	May 16

Miscellaneous

	Page	Date
A Railroad's Contribution to Forestry and the Paper Industry — Warren T. White	48	Oct. 24
Buckeye Improves Lab Efficiency to Handle Doubled Work Load	32	Aug. 8
Felt and Paper Industries Continue to Develop Together — Wayne G. Davis	34	Aug. 22
Finnish Industry in Midst of Major Expansion — John C. W. Evans	36	Jul. 11
How are Your Public Relations? — Paul Lockwood	28	Jan. 25
How Mill Standards Help Production — Eugene C. Ingalls	34	Sept. 5
How Newest Market Pulp Mills Form a Sheet and Dry Their Pulp	34	Feb. 1
How Paper Tubes Saved 200 Tons of Steel	49	May 2
How Paterson Serves Customers in Development of Specialty Papers	48	Mar. 21
Land Disposal: A Proven Approach to Stream Improvement at Weston — Ernest F. Barker	42	Oct. 3
Manufacturers and Merchants are Partners in Distribution — G. Willing Pepper	45	Apr. 18
New Communications System Aids Quality Control at New York and Penn	17	Dec. 26
Opportunities and Pitfalls of Research in Paper — Alfred H. Nissan	44	Mar. 7
Paper Industry Progress in Red China	23	Aug. 22
Pulp and Paper Manufacture Uses Impressive Quantities of Chemicals	46	Jan. 11
Raw Material Prospects for the Columbian Paper Industry—Walter L. Bender	50	Oct. 3
Round-up on Projected Pulp Mills For British Columbia	58	Apr. 11
St. Regis Paper Co.'s Products and Plants	52	Apr. 11
Some Forest Products Laboratory Notable Achievements	38	Jun. 13
Swiss Paper Museum Opens New Department	40	Nov. 21
Ultra-Modern Skyscraper New Headquarters for Crown Zellerbach	23	Aug. 8
Unique and Appropriate Use of Paper Sculpture in Advertising Series	45	Jun. 6

Papermaking

	Page	Date
A Fresh Look at Paper Machine Stock and White Water Systems	44	Dec. 12
Caliper Profiler Used as Control Instrument at West Virginia Mill — N. A. Ciannamea	36	Apr. 25
Continuous Felt Washing — A Growing Trend—Lawrence H. Brown	38	Jan. 18
Developments in Headbox Designs for High Speeds—H. A. Brewden and B. Locking	24	Aug. 8
Developments in Headbox Slices and Perforated Roll Design—H. A. Brewden and B. Locking	38	Aug. 15
Development of the World's Fastest and Widest Rotabelt Suction Unit—R. Mills	36	May 2
Double Wire Fourdrinier May Improve Wire Life and Formation — Akutushi Kitano	41	Dec. 19
Further Advances Reported in Clupak Extensible Paper and Boards	41	May 23
How a Corrosion Problem in a Dryer Condensate System Was Solved—Hugh E. Carr	42	Mar. 21
How International Makes Bleached Kraft Paper and Board—J. E. Pate and Guy J. Babin	20	Jan. 4
How to Improve Felt Performance when Using Wet Strength Resins—Ralph N. Prince	43	Apr. 4

	Page	Date
How to Make Book Papers with Longer Life	26	Jul. 25
Isotropic Clupak Paper Nears Commercial Production	30	Apr. 25
New Avisco Fiber is Boon to Specialty Papermakers—Howard E. Shearer	42	Nov. 7
New Developments in Paper Machine Headbox Design and Equipment—H. A. Brewden & B. Locking	36	Aug. 1
Maintenance of Paper Machine Drives Begins with Design and Installation—Herman A. Smith	40	Jan. 18
Many Benefits Gained from Conversion of Open Hood to Closed	41	Mar. 14
New "Milo Film" Starches Reduce Cost, Improves Quality of Size and Coatings	30	Mar. 28
New Needled Papermakers Felts Offer Advantages to our Industry—James E. Smith	50	May 16
Newsprint from Broadleaf Woods—J. N. Swartz	44	Oct. 10
Oy Kaukas Finds Plastic Wires Are Fine—Olli Saarnio	49	Sept. 12
Plastic Wires for Fourdrinier Machines Now Proven in Regular Operation—John C. W. Evans	36	Apr. 4
Progress Report on Mill Experience with Needled Felts—James E. Smith	40	Nov. 7
Putting a Number on Hair Shedding—L. G. Ward	42	Apr. 18
Recent Developments in Headboxes for Low Speed Paper Machines—E. J. Cole	24	May 30
St. Regis East Pepperell Mill Has Run Formex Wires for Two Years—Harry Dyer	38	Apr. 4
Some New Developments in Synthetic Fiber Paper—R. A. A. Hentschel	44	Nov. 14
Use of Formex Wires at CZ's Lebanon, Ore. Mill—Paul D. Van Derveer	37	Apr. 4
Using a Woven Plastic Fabric for Suction Transfer of the Sheet—Akitoshi Kitano	54	Oct. 10
Ventilation Systems Offer Years of Service with Little Attention — C. H. Guischard	50	Jun. 13
What About Forming Boards, Table Rolls, Flat Boxes and Dandy Rolls	23	Dec. 26
What Happens on the Press Section of a Fourdrinier—B. Locking	42	Jul. 11
What's New with Size Presses in Europe—Ernest F. Barker	36	Sept. 19
Wider Paper Machines Create New Problems for Vapor Absorption Systems—W. K. Metcalfe	40	Nov. 14

Production and Economic Review

Canadian Industry Progresses, Faces Up to Economic Problems—R. M. Fowler	34	Feb. 8
Economic Review and Forecast—W. LeRoy Neubrech	35	Apr. 25
How We Are Doing So Far This Year	51	May 2
How We Did Last Year — Outlook for 1960 and Beyond—W. L. Neubrech	32	Jan. 18
Industry Earnings Lag Further Behind Sales—John Surveyor	30	Aug. 29
1959 Capacity was 40 Million Tons, Joint APPA and NPA Survey Reveals—Benjamin Satin	49	Mar. 7
Paper and Board Industry—Outlook for 1960 and Review of 1959	25	Jan. 4
Paper Industry is Moving into a New High—Morris C. Dobrow	26	Feb. 22
Slight Drop in Sales — Big Drop in Earnings—John Surveyor	28	Nov. 28
Unbleached Kraft Paper Review — 1959—S. D. Fleet	48	Mar. 7
What the Fine Paper Manufacturers are Worrying About—George Olmsted Jr.	50	Apr. 11

Pulp and Stock Cleaning

Installation and Maintenance Improve Screen Performance—M. P. Hahn	30	Feb. 1
New Type Swedish Fractionator for Pulp, Depithing and Deinking	32	Aug. 22

Semi-Chemical Pulping

Continuous Production of Bleached NSSC Pulp—R. P. Green	43	Dec. 5
Hardwood-Sawdust for Cold Caustic Pulp Appears Feasible—William J. Greiner	27	Feb. 1
Hi Fibre Process of Hardwood Pulping—H. L. Crosby and Noel N. Coe	33	Mar. 28
How to Keep Getting Maximum Quality High Yield Pulp From Disk Refiners—David Sharp	46	Apr. 4
Italy's Latest NSSC Mill Utilizes Poplar Veneer Wastes — F. Frabetti and S. Johansson	34	Feb. 29
Newsprint from Broadleaf Woods — J. N. Swartz	44	Oct. 10
Recent Pulping Processes Show Advantages in Cost Comparisons — Roy W. Emery	54	Apr. 11
Research on Chemi-Mechanical Pulps from Various Softwoods and Hardwoods—G. H. Chidester	51	Jul. 18
Unique New Continuous Digesters Improve Operations at Two Mills—Paul D. Van Derveer	36	Sept. 5

Stock Preparation

A Fresh Look at Paper Machine Stock and White Water Systems	44	Dec. 12
Determining Minimum Chest Levels for Continuous Pumping Applications—P. J. Olmstead	30	Feb. 29
How Bure AB Stores Groundwood in "Agitator-Less" Towers	35	Aug. 1
How Nicolet Solved Glassine Refining Problems	36	Oct. 3
How To Solve Stock Pumping Problems Ahead of Time—A. E. Risk	41	Jun. 13
Keeping Your Conical Refiner to a Ripe Old Age with Less Time Out—Paul B. Stretch	46	Aug. 15
Latest Thoughts on Understanding The Response of Chemical Pulp to Refining—E. F. Thode	43	Jul. 18
Process Instrumentation for Continuous Refining—R. F. Barber	24	Oct. 31
Pulp Refining — Comparing a Valley Beater, Ball Mill and Commercial Jordan—B. K. Moyer	35	Jul. 25
Recent Developments in Wet-Strength Resins—Gary C. Grinnell	35	Mar. 28
Start Out Right by Installing that Conical Refiner Correctly—T. J. McGraw	48	Sept. 19
Which of the Three Possible Kinds of Stock Chest Agitation to Use	50	Feb. 15

	Page	Date
Why are Pump-Through Refiners Being Used? How? — D. A. Borden	42	Jun. 6

Sulphite Pulping

High Yield Sulphite Pulping — J. E. Lambert	36	Oct. 24
How Gaspesia Achieved Tops in Bleached Sulphite Production — John C. W. Evans	30	Nov. 28
New Capacity for Spent Sulphite Liquor Products at Lignosol Chemicals	46	Sept. 12
Recent Pulping Processes Show Advantages in Cost Comparisons—Roy W. Emery	54	Apr. 11
Swedish Mill Bleaches Sulphite Pulp with Chlorine Dioxide—Per Svanberg	28	Jul. 25
Today's Methods of Washing Sulphite Pulp in the Scandinavian Countries—P. Salantera	32	Apr. 25

Waste Paper

All Aspects of Waste Paper Generation, Distribution and Utilization Examined —Harry Dyer	44	Jun. 20
Elk Paper Company Eliminates Asphalt Problems in Waste Paper Stock	32	Jul. 18
Forecasts Gain in Waste Paper Utilization This Year	41	Mar. 21
Four Possible Systems Available for Dispersion of Asphalt in Waste Paper — Philip S. Bolton	50	Sept. 12
Mill Trials Show Chemical Compound Effective Dispersant for Asphalt	45	Jan. 18

Wood Rooms and Woodhandling

Completely New Design of Log Barking Equipment Announced	40	Jun. 20
Considerations for the Use of Belt Conveyors in the Woodyard—J. M. Shepard	20	Mar. 28
Design of Celgar's New Woodroom Presented Interesting Problems	35	Jul. 4
How Gaspesia Achieved Tops in Bleached Sulphite Production — John C. W. Evans	30	Nov. 28
How Scott Pioneered in the Barking and Pulping of Red Alder — Ernest F. Barker	39	Jul. 11
Huge Bark Press at Scott Saves Large Quantities of Fuel Oil—E. F. Barker	46	May 9
Kraft Pulping of Sawdust and Shavings in a Pandia Digester	28	Jul. 4
Loading and Unloading Pulpwood — Thomas N. Busch	40	Oct. 10
Proper Chipper Knife Care Can Reduce Costs and Produce Better Chips — George Bevis	40	Dec. 5
Reducing Drum Barker Troubles Through Preventive Maintenance — Vincent Dawson	36	Dec. 12
Six Basic Rules Still Exist in Caring for Today's Chipper—N. P. Wardwell	46	Jul. 18
Thilmany Streamlines Woodroom Operation for Greater Efficiency—Paul D. Van Derveer	20	May 30
Storing Pulpwood Underwater in Winter at a Finnish Mill—P. Salantera	46	Mar. 14
Weighing Chipper Sawdust Saves Knives —Lawrence M. Gibson	29	Feb. 22

Author Index to 1960 Feature Articles

A

Adams, Donald S.—Materials Handling and the Materials Management Concept—40, March 7.

Alonso, Bernardo—Continuity of Lime Kiln Operation Through Maintenance Control—36, Jan. 11.

Andrews, Edgar—Future of Electronic Instrumentation in the Pulp and Paper Industry—30, Aug. 8.

B

Babin, G. J.—How International Makes Bleached Kraft Paper and Board—20, Jan. 4.

Baldwin, Norman—How to Plan a Better Bleach Plant Maintenance Program—34, Dec. 19.

Barber, R. F.—Process Instrumentation for Continuous Refining—24, Oct. 31.

Barker, Ernest F.—Calcasieu's "Do-It-Yourself" Approach to a Decade of Growth—36, Oct. 10; How Scott Pioneered in the Barking and Pulping of Red Alder—39, July 11; Huge Bark Press at Scott Saves Large Quantities of Fuel Oil—46, May 9; Land Disposal: A Proven Approach to Stream Improvement at Weston—42, Oct. 3; Mead Now Bleaches Hardwood Soda Pulp with Chlorine Dioxide—24, Feb. 29; What's New with Size Presses In Europe—36, Sept 19.

Bartley, H. N.—Material Handling Economics of Unloading Pulpwood from Rail Cars—36, Aug. 15.

Bender, Walter L.—Raw Material Prospects for the Columbian Paper Industry—50, Oct. 3.

Bevis, George—Proper Chipper Knife Care Can Reduce Costs and Produce Better Chips—40, Dec. 5.

Bobreski, Alexander F.—New Developments in Coating Further Complicate Selection of Method Used—30, July 4.

Bolton, Philip S.—Four Possible Systems Available for Dispersion of Asphalt in Waste Paper—50, Sept. 12.

Borden, D. A.—Why are Pump-Through Refiners Being Used? How?—42, June 6.

Bowles, W. Donald—What are the Trends of Soviet Foreign Trade in Pulp and Paper—40, Sept. 19.

Brewden, H. A.—Developments in Headbox Designs for High Speeds—24, Aug. 8.

Brown, Jack N.—Black Liquor Evaporators Require Optimum Tube Cleanliness—48, March 14.

Brown, Lawrence H.—Continuous Felt Washing—A Growing Trend—38, Jan. 18.

Busch, Thomas N.—Loading and Unloading Pulpwood—40, Oct. 10.

C

Carr, E. Hugh—How a Corrosion Problem in a Dryer Condensate System was Solved—42, March 21.

Cash, Carson B.—Know How, Spare Parts Mean Better Slitter and Winder Maintenance—56, Sept. 12.

Chidester, G. H.—Research on Chemi-Mechanical Pulps from Various Softwoods and Hardwoods—51, July 18.

Ciannamea, N. A.—Caliper Profiler Used as Control Instrument at West Virginia Mill—36, April 25.

Coe, Noel N.—HiFibre Process of Hardwood Pulping—33, March 28.

Cole, E. J.—Recent Developments in Headboxes for Low Speed Paper Machines—24, May 30.

Collier, R. B.—Cutting Maintenance Costs in the Refining of Groundwood Rejects—24, Jan. 25.
Copeland, W. H.—Care in Operation Key to Maintenance of Modern Pulpstones—30, Feb. 22.
Crannell, Wayne, T.—Clean! Is What You Should Keep Your Size Press—29, Aug. 22.
Crommelin, P. B.—Attaining Steady Service from Your Electrostatic Precipitator—48, April 18.
Crosby, H. L.—HiFibre Process of Hardwood Pulping—33, March 28.

D

Davis, P. W.—28-Ton Metal Stack, 125 Feet High Creates Unusual Erection Problem—28, Oct. 31.
Davis, W. G.—Felt and Paper Industries Continue to Develop Together—34, Aug. 22.
Dawson, V.—Reducing Drum Barker Troubles Through Preventive Maintenance—36, Dec. 12.
Dobrow, M. C.—Paper Industry is Moving Into a New High—26, Feb. 22.
Draxler, John A.—Putting Electrical Industrial Trucks in The Proper Perspective—46, June 6.
Dubert, A.—How to Improve Roll Condition for Web Offset Printing—42, Oct. 10.
Dunham, Bruce M.—How to Cut Lubrication Costs—Meet all Needs with Only Ten Lubricants—44, Oct. 24.
Dyer, H.—All Aspects of Waste Paper Generation, Distribution and Utilization Examined—45, June 20; ALP Starts Up Alaska's Newest MgO Sulphite Mill at Sitka—36, Feb. 15; Celotex Starts up World's Most Automated Fiberboard Mill—30, Nov. 21. Eastern Completes Remodeling No. 2 Fine Paper Machine—28, May 23; St. Regis Adds Zinc-Hydro Stage to Peroxide Bleach Plant—34, April 18; St. Regis East Pepperell Mill Has Run Formex Wires for Two Years, 38, April 4.

E

Eberhardt, L. E.—Interesting Technological Features of Japan's Pulp and Paper Industry—34, Feb. 22.
Emery, R. W.—Recent Pulping Processes Show Advantages in Cost Comparisons—54, April 11.
Evans, John C. W.—Finnish Industry in Midst of Major Expansion—36, July 11; How Gaspesia Achieved Tops in Bleached Sulphite Production—30, Nov. 28; Major Modifications at Demopolis Permit Bleached Board Manufacture—36, March 21; Outlook for Market Pulp Here and Abroad, 24, Sept. 5; Plastic Wires for Fourdrinier Machines Now Proven in Regular Operation—36, April 4; Western Canada's First Fine Paper Mill—Small but Unique—38, Sept. 26.

F

Fleet, S. D.—Unbleached Kraft Paper Review—1959—48, March 7.
Fowler, R. M.—Canadian Industry Progresses, Faces Up to Economic Problems—34, Feb. 8.
Frabetti, F.—Italy's Latest NSSC Mill Utilizes Poplar Veneer Wastes—34, Feb. 29.
Frazier, W. R.—Preventing Costly Downtime on Today's "Assembly Line" Trimmer—45, March 21.

G

Gardner, J. K., Jr.—How to Get and Keep Good Doctoring—46, Nov. 14.
Gibbs, C. W.—Air Compressors are Reliable Machines—How to Keep Them That Way—42, May 2.
Green, R. P.—Continuous Production of Bleached NSSC Pulp—43, Dec. 5.
Greiner, T. S.—How the Synchro—Fly Cutter Works—34, Aug. 1.
Greiner, W. J.—Hardwood-Sawdust for Cold Caustic Pulp Appears Feasible—27, Feb. 1.
Grinnell, G. C.—Recent Developments in Wet-Strength Resins—35, March 28
Gue, William M.—Fallacy for Grinder Motors is Neglect; Fact is Periodic Inspection—26, Aug. 29.
Guischard, C. H.—Ventilation Systems Offer Years of Service with Little Attention—50, June 13.

H

Hahn, M. P.—Installation and Maintenance Improve Screen Performance—30, Feb. 1.
Hentschel, R. A. A.—Some New Developments in Synthetic Fiber Paper—44, Nov. 14.
Hoguet, P. W.—Forecasts Gain in Waste Paper Utilization this Year—41, March 21; Long Term Outlook for Corrugated Container Demand—43, June 27.

I

Ingalls, Eugene C.—How Mill Standards Help Production—34, Sept. 5.

J

Johansson, S.—Italy's Latest NSSC Mill Utilizes Poplar Veneer Wastes—34, Feb. 29.
Joy, Frank B.—Proper Calender Roll Maintenance is Essential to Paper Quality—42, Nov. 21.

K

Kitano, Akitoshi—Using a Woven Plastic Fabric for Suction Transfer of the Sheet—54, Oct. 10; Double Wire Fourdrinier May Improve Wire Life and Formation—41, Dec. 19.
Kleinman, G.—Black Liquor Evaporators Require Optimum Tube Cleanliness—48, March 14.
Kuehn, H. E.—A New Approach to Roll Crowning—Particularly for Calenders—36, July 18.

L

Lagerloef, E. G.—Will the Russians Overtake the U. S. Pulp & Paper Industry—38, March 7.
Lambert, J. E.—High Yield Sulphite Pulping—36, Oct. 24.
Leighton, R. M.—Care of Rubber Covered Rolls—32, Feb. 29.
Locking, B.—Developments in Headbox Designs for High Speeds—24, Aug. 8; What Happens on the Press Section of A Fourdrinier—42, July 11.
Lockwood, P.—How are Your Public Relations?—28, Jan. 25.

M

MacDermott, E. H.—Chimney Design and Upkeep—How and Why of It—31, July 25.
Metcalfe, W. K.—Wider Paper Machines Create New Problems for Vapor Absorption Systems—40, Nov. 14.
McGraw, T. J.—Start Out Right by Installing that Conical Refiner Correctly—48, Sept. 19.
Mills, R.—Development of the World's Fastest and Widest Rotabelt Suction Unit—36, May 2.
Moriarty, Tim F.—Fifty Years of Hand Lift Trucks—48, July 11.
Moyer, B. K.—Pulp Refining—Comparing a Valley Beater, Ball Mill and Commercial Jordan—35, July 25.
Mullen, W.—New Process Applies Polyethylene Solution to Paper—35, Aug. 8.

N

Neubrech, W. L.—Economic Review and Forecast—35, April 25; How We Did Last Year—Outlook for 1960 and Beyond—32, Jan. 18.

Nissan, A. H.—Opportunities and Pitfalls of Research in Paper—44, March 7.
Norman, E. B.—Main Concern of the Modern Supercalender is its Filled Rolls—59, April 11.

O

Olmsted, George, Jr.—What the Fine Paper Manufacturers are Worrying About—50, April 11.
Olmstead, P. J.—Determining Minimum Chest Levels for Continuous Pumping Applications—30, Feb. 29.
Owen, I. H.—Installation Plus Bearing Lubrication Equals Long-Lived Vacuum Pumps—40, June 27.

P

Pate, J. E.—How International Makes Bleached Kraft Paper and Board—20, Jan. 4.
Pearson, L. S.—The Pursuit of Finishing—24, March 28.
Pepper, G. W.—Manufacturers and Merchants are Partners in Distribution—45, April 18.
Perrin, A. P. Jr.—Some Definite Improvements in a Mill's Finishing Operations—24, July 25.
Perry, J. H.—Care in Operation Key to Maintenance of Modern Pulpstones—30, Feb. 22.
Peterson, C. J.—Flash Drying Yields Quality-Plus Pulp for Norwegian Mill—44, June 13.
Poehlmann, A. E.—Getting the Best Performance from Your V-Belt Drives—30, May 30.
Prince, R. N.—How to Improve Felt Performance When Using Wet Strength Resins—43, April 4.

R

Rabkin, S.—Attaining Steady Service from Your Electrostatic Precipitator—48, April 18.
Richmond, George—It's Simple to Make Special Adhesives for Special Bags—30, Jan. 25.
Rinfret, Claude J.—How the Eldema Electronic Paper Sorting Machine Operates—32, Oct. 24.
Risk, A. E.—How to Solve Stock Pumping Problems Ahead of Time—41, June 13.
Robinson, J. W.—Bleached Board Finishing Operations Need a Fresh Look—42, Oct. 17.
Roehner, Henry J.—Narrow Aisle Trucks Solve Paper Handling Storage Problems—53, Nov. 7.

S

Saarnio, O.—Oy Kaukas Finds Plastic Wires Are Fine—49, Sept. 12.
Salantera, P.—Today's Methods of Washing Sulphite Pulp in the Scandinavian Countries—32, April 25; Storing Pulpwood Underwater in Winter at a Finnish Mill—46, March 14.
Schiller, Francis E.—How to Operate a Supercalender—Particularly on Coated Papers—28, Sept. 5; Supercalendering Coated Papers is One of the Important Finishing Operations—24, Aug. 22.
Schnabel, P. M.—Automatic Continuous Production of Hypochlorite Bleach Liquor at St. Helens—40, May 2.
Schnyder, A. P.—What's New in the Design of Groundwood Mills—62, Dec. 5.
Sharp, David—How to Keep Getting Maximum Quality High-Yield Pulp from Disk Refiners—46, April 4.
Shaw, F. B.—High Quality Metalized Paper Demands Specialized Techniques—46, Oct. 3.
Shearer, Howard E.—New Avisco Fiber is Boon to Specialty Papermakers—42, Nov. 7.
Shepard, J. M.—Considerations for the Use of Belt Conveyors in the Woodyard—20, March 28.
Slatin, Benjamin—1959 Capacity Was 40 Million Tons, Joint APPA and NPA Survey Reveals—49, March 7.
Smith, H. A.—Maintenance of Paper Machine Drives Begins with Design and Installation—40, Jan. 18.
Smith, J. E.—New Needled Papermakers Felts Offer Advantages to Our Industry—50, May 16; Progress Report on Mill Experience with Needled Felts—40, Nov. 7.
Stretch, P. B.—Keeping Your Conical Refiner to Ripe Old Age with Less Time Out—46, Aug. 15.
Stubblebine, W.—How to Use Stowe Woodward Nip and Crown Test Method—45, Nov. 21.
Surveyor, J.—Industry Earnings Lag Further Behind Sales—30, Aug. 29; Slight Drop in Sales—Big Drop in Earnings—28, Nov. 28.
Svanberg, Per—Swedish Mill Bleaches Sulphite Pulp with Chlorine Dioxide—28, July 25.
Swartz, J. N.—Newsprint from Broadleaf Woods—44, Oct. 10.

T

Thode, E. F.—Latest Thoughts on Understanding the Response of Chemical Pulp to Refining—43, July 18.

V

Vance, H. W.—Hammermill Completes $20 Million Expansion Program at Erie—26, Jan. 4.
Van Derveer, Paul D.—Conveyor System With "A Mind of Its Own"—18, Dec. 26; Engineers Reveal Data on New Developments—44, Nov. 7; Highest Tonnage Machine in the World—The Seminole Chief—32, Sept. 26; Make Way for Byron Weston's New Fine Paper Machine—28, Dec. 19; New Design of CLO_2 Bleach Tower Cuts Costs at Potlatch—20, Aug. 8; New Eight Cylinder Wet End Installed in Record Time by Bestwall—20, Aug. 29; New Marathon Board Machine Features Calender with Instant Crown Control—30, Oct. 17; Nicolet Pioneers Unique Equipment with New Glassine Paper Machine—38, May 9; Owens-Illinois Starts Up New Machine for Corrugating Medium—36, March 14; Scott Reveals Details of Mobile Tissue Operation—20, Nov. 28; Thilmany Streamlines Woodroom Operation for Greater Efficiency—20, May 20; Unique Automatic Roll Handling System in Operation at St. Joe Paper Co.—28, Aug. 1; Unique New Continuous Digesters Improve Operations at Two Mills—36, Sept. 5; Use of Formex Wires at CZ's Lebanon, Oregon Mill—37, April 4; World's Largest Kraft Pulp and Paper Mill Keeps on Growing—40, May 16.

W

Wagner, George M.—"Rolling Modernization" Increases Production and Efficiency at Downingtown—26, April 25.
Ward, L. G.—Putting a Number on Hair Shedding—42, April 18.
Wardwell, N. P.—Six Basic Rules Still Exist in Caring for Today's Chipper—46, July 18.
Weaver, Jack—New "Milo Film" Starches Reduce Cost, Improve Quality of Size and Coatings—30, March 28.
Whitaker, Howard E.—Some Problems of Our Industry and What Should Be Done About Them—30, Oct. 31.
White, M. C.—Some "Cost Cutters" in The Handling of Wet Lap Pulp—34, Aug. 8.
White, Warren, T.—A Railroad's Contribution to Forestry and the Paper Industry—48, Oct. 24.
Woodburn, Clyde D.—It's Simple to Make Special Adhesives for Special Bags—30, Jan. 25.

Z

Zouck, Peter G.—Alkaline Digester Maintenance Using Stainless Steel Overlay—33, Oct. 31.

Prices of Fibers

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Delivered Basis

	U.S.	Canadian	Swedish	Finnish	Norwegian
Groundwood	$ 82.50/ 90.00	$82.50/ 90.00	§90.00/ —	§90.00/ —	§90.00/ —
Bleached Gw'd.	$ 97.50/100.00	$97.50/100.00			
Kraft, Blchd.	‡135.00/150.00	140.00/150.00			§157.50/ —
Kraft, Blchd. Hdwd.	135.00/140.00		140.00/ —		
Kraft, Semi-bleached.	130.00/140.00				
Kraft, Unbl.	117.50/125 00	125.00/ —	†125.00/130.00	125.00/ —	
Sulphite, Blchd.	135.00/140.00	135.00/140.00	*155.00/ —	*155.00/ —	155.00/ —
Sulphite, Bl. Hdwd.	135.00/ —				
Sulphite, Unblchd.	135.00/ —	135.00/ —	†135.00/ —	*135.00/ —	
Sulphite, Unb'l. Gl'sn.		140.00/ —	†134.00/ —		
Soda, Blchd.	130.00/135.00	130.00/135.00			

§ On Dock Atlantic Ports. * Freight allowed. † Varying Freight Allowances
‡ Depending on Brightness.

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F.O.B. OIL MILLS
WEEK ENDED DECEMBER 6

	Atlanta	Memphis	Dallas	Los Angeles
Grade 1	n.a.	n.a.	n.a.	n.a.
2	n.a.	n.a.	n.a.	8.00/7.50
3	$7.00/6.50	$7.50/7.25	$7.50/7.00	7.25/6.75
4	6.50/5.75	6.50/6.25	6.50/6.25	6.50/6.25
5	5.75/5.25	6.00/5.75	6.00/5.50	— /6.00
6	5.25/4.25	5.25/5.00	5.25/5.00	5.00/4.25
7	4.25/3.50	4.50/4.00	4.75/4.00	n.a.

WASTE PAPER MARKET

Mill Prices, f.o.b. Trucks Shipping Point — Includes Brokerage

These quotations are a partial indication of the price range on volume tonnage in each market on the date specified, as gathered from major dealers and brokers. SPECIAL PACKINGS AND SPOT TONNAGE NOT INCLUDED. Prices nominal.

	New York	Boston	Chicago	Los Angeles
	Dec. 12	Dec. 12	Dec.	Dec.
No. 1 Mixed Paper	$ 7.00/ 9.00	4.00/ 7.00	6.00/	12.00/ —
No. 1 News	12.00/ 13.00	11.00/ —	11.00/ —	12.00/ —
Overissue News (Lg. size)	11.00/ 13.00	9.00/ 11.00	16.00/ —	18.00/ —
Mill Wrappers	19.00/ 22.00	9.00/ 11.00	9.00/ -	13.00/ —
Old Corrugated Containers	19.00/ 20.00	17.50/ 18.00	18.00/ —	17.00/ 18.00
Super Resorted Kraft Paper	35.00/ 40.00	— / —	28.00/ —	50.00/ 55.00
New Double Kr. Ld. Corr. Cuts	27.50/ 30.00	30.00/ 32.50	30.00/ —	27.50/ 30.00
(Semi-chem. medium)	45.00/ —	45.00/ —	42.50/ —	— / —
New 100% Kraft Corr. Cuts	40.00/ 42.50	— / —	52.50/ —	— / —
New Br. Kraft, Env. Cuts	65.00/ 70.00	65.00/ 70.00	47.50/ —	55.00/ 60.00
New Br. Kr. Bag Waste Prntd.	50.00/ 55.00	50.00/ 60.00	47.50/ —	45.00/ 50.00
New Br. Kr. Bag Waste Unprintd.	55.00/ 60.00	60.00/ 65.00	55.00/ —	50.00/ 55.00
No. 1 Groundwood Shvs.	25.00/ 30.00	20.00/ 25.00	10.00/ —	30.00/ 32.50
White Newsblanks	42.50/ 45.00	47.50/ 52.50	30.00/ —	55.00/ —
No. 1 Soft White Shvs.	55.00/ 60.00	55.00/ 60.00	50.00/ —	75.00/ —
Super Soft White Shvs.	65.00/ 75.00	70.00/ 80.00	60.00/ —	— / —
Hd. White Shvs.	75.00/ 80.00	80.00/ 90.00	75.00/ —	85.00/ —
Hd. White Env. Cuts	90.00/ 95.00	100.00/105.00	80.00/ —	103.00/ —
Col. Tab. Cards	40.00/ 42.50	40.00/ 42.50	37.50/ —	35.00/ 40.00
Manila Tab. Cards	57.50/ 60.00	57.50/ 60.00	55.00/ —	60.00/ 65.00
No. 1 Col. Ledger	32.50/ 35.00	30.00/ 35.00	40.00/ -	24.00/ 27.00
White Ledger	45.00/ 50.00	42.00/ 47.00	50.00/ -	45.00/ 55.00
Mixed Book & Mag.†	— / —	— / —	10.00/ —	— / —
No. 1 Books‡	15.00/ 17.50	22.00/ 24.00	25.00/ —	10.00/ 12.00

† Includes Time & Life; no coarse groundwood. ‡ Not to exceed 10% of groundwood.

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NEW EQUIPMENT & SUPPLIES

Ball Valves Have Full Port of Pipe Diameter

Designed around the inside diameter of standard pipe, the line of 3 inch through 6 inch Full Port Bubble

Tight Ball Valves by the J. L. Putnam Co., Inc. of Biddeford, Me., are offered in many materials. The valves are manufactured in both the 150 pound and 300 pound series. Non-standard flanged valves are available as special items.

The full port in the valve's sphere is as free and open as the pipe the valve fits. This sphere is sealed with dual compressive seats which are filleted for longer wear and precision engineering has resulted in lower torque. A Putnam valve requires no lubrication.

Pressure or vacuum can be handled in either direction. Remote control operators can be supplied to plants using automation. Putnam also offers Full Port Ball Valves in ¼ through 3 inch screwed end sizes and ½ through 2 inch, 8 through 12 inch flanged end sizes.

Steep Inclines No Problem for Conveyor Belt

A conveyor belt with molded ridges carries wet or dry materials up steeper inclines than its predecessors, according to B. F. Goodrich Industrial Products Co., Akron, Ohio. P. W. Perdriau, president of BFG's Industrial Products Co., said the Ridgelock belt is designed primarily for wood chip handling but it carries other bulk materials with equal ease. The molded ridges reduce "fall-back" as the various materials are carried up inclines.

Because sliding is reduced, the capacity of the belts is actually increased, Mr. Perdriau said. The ridges are in herringbone design, pointed in the direction the belt is traveling. The Ridgelock belt can be constructed with cotton, Nyfil or rayon reinforcements with a rubber cover compounded for the type material handled, he said.

Push Button Motor Control Station is All-Rubber

A heavy duty push-button station of corrosion-proof, all-rubber, weather-sealed construction has been introduced by Joy Manufacturing Co.

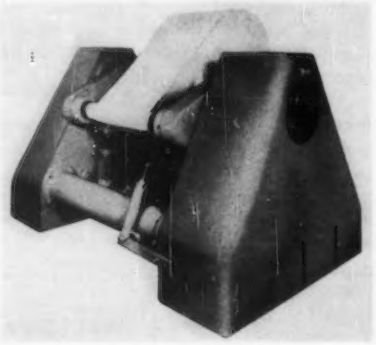
Known as the Flexitite Switch, it is recommended for any 2-station push-button application, such as start-stop, up-down, forward-reverse, off-on, etc. The production model meets NEMA types 1, 4 and 5 enclosure requirements for both heavy and standard duty operation.

The Flexitite Switch fits all standard FS and FD boxes. In addition,

flush mounting can be achieved on metal surfaces. It incorporates micro type one or two pole switches tailored to specifications, with normally open and/or normally closed contacts. Each switch package includes optional choice of station legend plates and snap-in oversize buttons. Molded rubber construction is said to provide complete operator safety, long life, and corrosion-free operation. For additional information write Joy Manufacturing Co., Electrical Products Division, 1201 Macklind Ave., St. Louis 10, Mo.

Flying Web Starts Developed for Center Winders

A device for automatically starting new rolls of paper and board on center winders is announced by



Waldron-Hartig Division of Midland-Ross Corp., New Brunswick, N. J.

R. J. Jacobs, vice president and general manager of Waldron, states that the "Waldron Method" for which patents have been applied, represents one of the most significant contributions to high speed web handling developed in recent years.

The "Waldron Method," which consists of a low inertia cut-off device accelerated by the web itself was perfected on a 30 inch wide two spindle rotating center winder by the Waldron Development Department earlier this year. This unit is maintained for demonstration on different materials to web process converters and mills.

Grades of paper from light weights to heavy chipboard have been started on new cores at speeds to 2000 f.p.m. without fold back or wrinkles so that waste at the core is a bare minimum.

The "Waldron Method" core starting device can readily be adapted to existing two or three spindle rotating type center winders, and inexpensive conversion units are available.

PJT NEWS OF SUPPLIERS

C. Schwarzler

H. O. Ehrisman

V. V. Tivy

T. E. Clark, Jr.

The Foxboro Co., Foxboro, Mass., to coordinate its worldwide sales activities in light of a growing volume of instrument sales, has added a marketing division which will serve its associated companies in England, Canada, Holland and Japan, as well as its U. S. market.

Appointed vice president of marketing is C. Schwarzler who, as head of the new division, will be responsible for planning and directing the development of new market areas and disseminating Foxboro instrument engineering information throughout the world.

Sales growth in the domestic market has been reflected by the appointment of H. O. Ehrisman as vice president and U. S. general sales manager. His primary responsibility will be the company's 61 branch offices in the U.S. and related home office sales operations.

V. V. Tivy in his new position of director of engineering will be responsible for the interpretation of market trends in instrumentation and for encouraging the development and initial sale of new products to meet these trends. He will also continue as head of the systems engineering division.

Mr. Schwarzler has been associated with Foxboro for the past 26 years, being appointed export manager in 1944 and manager of international operations in 1955.

Mr. Ehrisman joined the firm in 1936, having previously been associated with Atlantic Precision Instrument Co. and Holtzer-Cabot Electric Co.. He was appointed manager of sales promotion in 1945, and four years later, assistant general sales manager. He has been general sales manager since 1955.

Mr. Tivy, formerly of Neal & Massy Engineering Co. and M. W. Kellogg Co., came to Foxboro in 1945 as manager of instrument sales for the oil and gas industries. In 1955 he was made chief application engineer. In 1958 he organized and directed the systems engineering division which was expanded in 1959 to include a computing control group.

Holyoke Machine Co. announces that Thomas E. Clark, Jr., formerly assistant treasurer and assistant to the president, has been placed in charge of sales for the territory serviced by the late George O. Trudeau.

Fisher Governor Co., Marshalltown, Iowa, has announced that the company's line of controls will soon be manufactured in Mexico.

The arrangements were made with a group of Mexican citizens in Monterrey, Mexico, headed by Sr. Hector Santos, Jr., to manufacture the complete line of Fisher automatic controls under the corporate name of Controles Automaticos, S. A. Manufacturing will be located in a new building in Monterrey.

All products manufactured by the Mexican firm will be in exact accordance with the high standards and specifications of all Fisher controls. All parts of the new products to be manufactured in Mexico will be interchangeable with Fisher controllers now installed in that country. The Fisher name and trademarks will be used on all products.

It is expected that the new plant will start installing machinery and operating equipment shortly after the first of the year and be in production as soon as possible after that. Controles Automaticos, S. A. will continue to operate with sales representation similar to the present Fisher sales policy.

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Figures of the Week

PAPER PRODUCTION RATIO REPORT—American Paper & Pulp Assn. Figures
(Production as per cent of normal capacity)

COMPARATIVE WEEKLY SUMMARIES

	Nov. 12	Nov. 19	Nov. 26	Dec. 3	Dec. 10
1960	96.9	91.3r	86.3r	93.3r	93.9
	Nov. 14	Nov. 21	Nov. 28	Dec. 5	Dec. 12
1959	96.5	96.3	93.8	95.9	97.0

r Revised.

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1960	96.5	97.7	98.1	96.9	97.6	96.1	81.2	91.7	89.1	94.8‡	91.9‡	—	—
1959	87.8	90.5	93.2	94.4	95.5	95.6	84.5	96.0	92.4	97.4	96.2	86.6	92.2

‡ Preliminary.

COMPARATIVE YEARLY SUMMARIES

	1953	1954	1955	1956	1957	1958	1959	1960
Year to Date	94.2	92.2	96.7	98.5	91.1	87.4	92.9	93.8
Year Average	92.3	91.6	96.2	97.9	90.4	87.0	92.2	—

All of the above data is based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available.

PAPERBOARD OPERATING RATIOS†—National Paperboard Assn. Figures

COMPARATIVE WEEKLY SUMMARIES

	Nov. 12	Nov. 19	Nov. 26	Dec. 3	Dec. 10
1960	92	89	81	79	91
	Nov. 14	Nov. 21	Nov. 28	Dec. 5	Dec. 12
1959	95	95	91	86	96

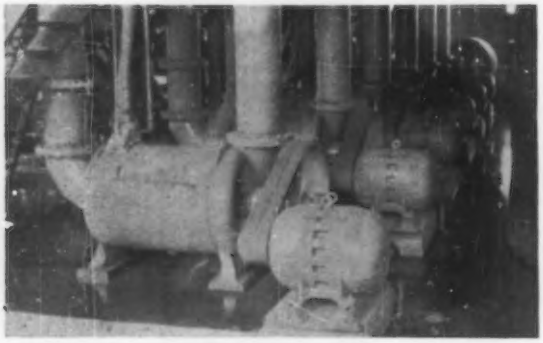
COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1960	92	95	94	93	94	92	78	93	87	93	86	—	—
1959	89	94	95	94	96	96	83	97	92	96	94	80	92

‡Preliminary.
† *Per cents of operation based on "inch-hours" reported on a 6 day basis to the National Paper board Association.*

SUMMARY OF PAPERBOARD STATISTICS—National Paperboard Assn. Figures

ITEM	WEEK ENDING Dec 10, 1960	WEEK ENDING Dec. 3, 1960	CUMULATIVE TO DATE Jan. 1, 1960 to Dec. 10, 1960
% Activity	91%	79%	91%
Total	316,846	280,359	15,129,647
Containerboard—Domestic Use	161,232	145,108	7,815,306
Liner	108,488	99,517	5,250,154
Corrugating Material	48,995	41,800	2,321,636
Chip & Filler Board	3,749	3,791	243,516
Boxboard—Domestic Use	96,315	85,501	4,643,830
Folding	57,688	49,413	2,779,386
Set-Up	9,695	8,339	525,169
Special Food Board	28,932	27,749	1,339,275
Other Paperboard	59,299	49,750	2,670,511
Containerboard Type	29,333	26,418	1,280,327
Boxboard Type	29,966	23,332	1,390,184
Total Orders			
Received	290,643	307,561	
Unfilled End of Week	380,598	409,354	



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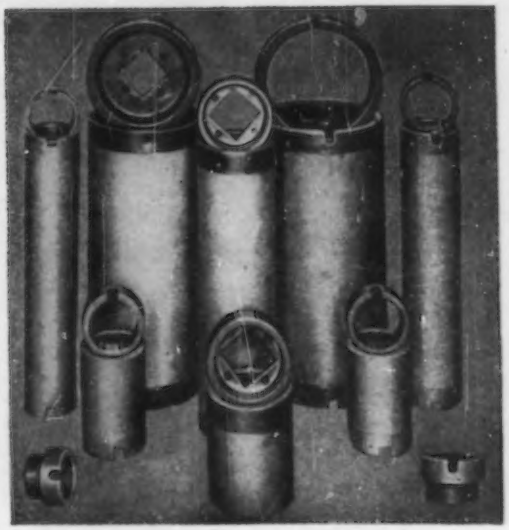

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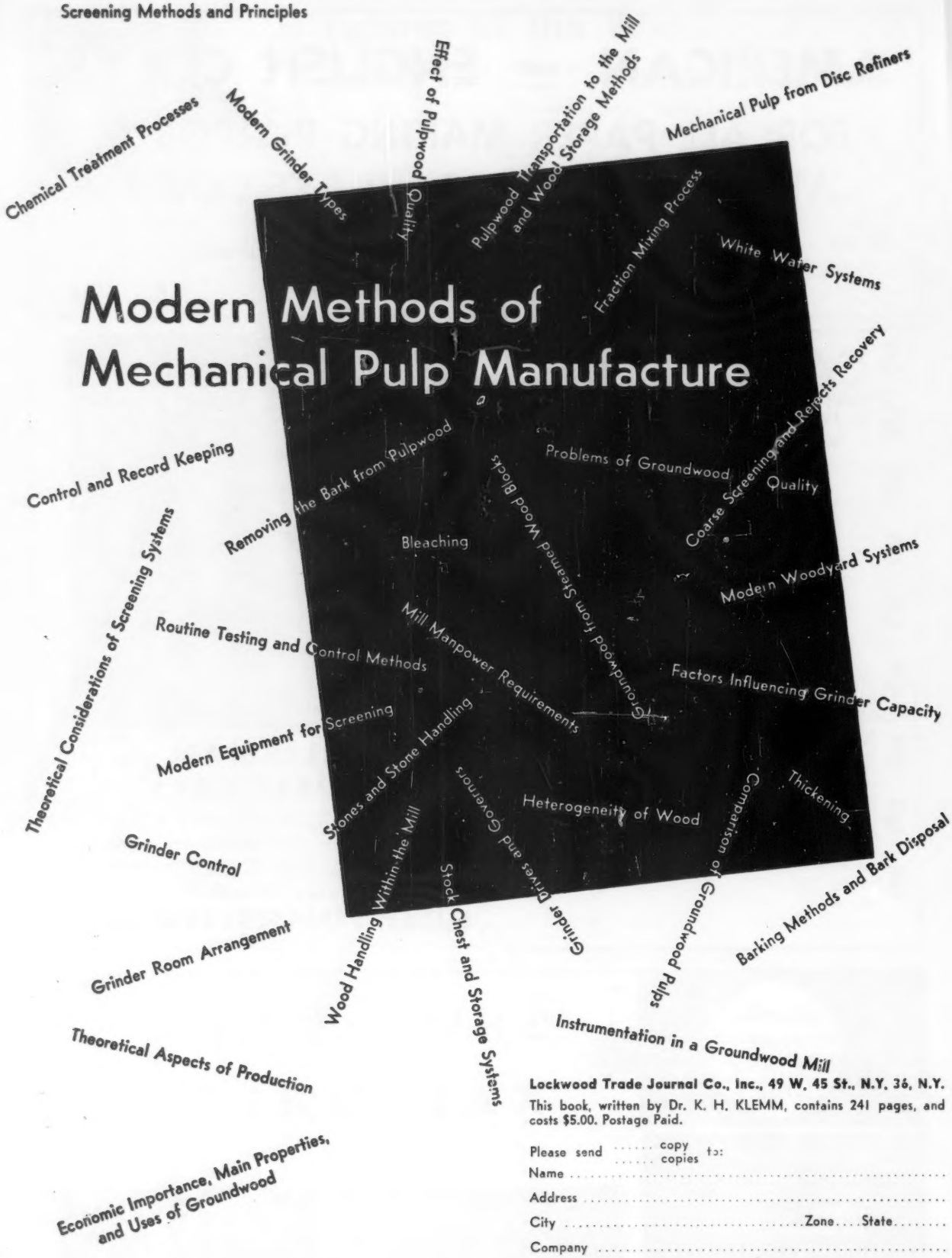
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The proposals will be opened in the presence of and the award of contracts made by the Joint Committee on Printing to the lowest and best bidders for the interest of the Government whose bids are in conformity with the requirements of the proposal. The committee reserves the right to reject any or all bids, or to accept any bid or any part and reject the other part if, in its opinion, such action would be in the interest of the Government.

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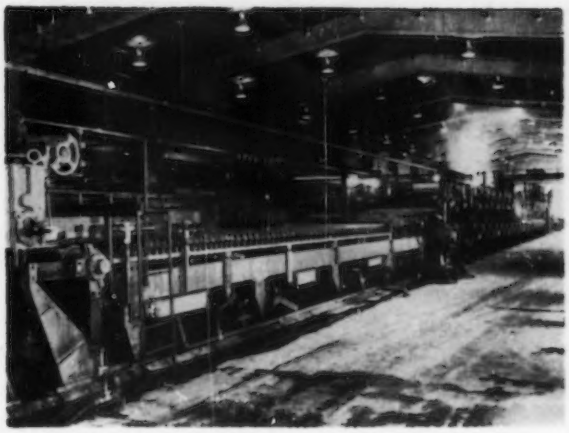

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American Steel & Wire Co. .... —
American Viscose Corp. .... —
Ames Company Inc. .... —
Anglo American Clays Corp. .. 45
Anglo-Canadian Pulp & Paper Mills 8
Anglo Paper Products Ltd. 8
Antara Chemicals, Sales Div. Gen. Aniline & Film Corp. .. —
Apmew, Inc. 44
Appleton Machine Co. .... —
Appleton Wire Works .... —
Armco Drainage & Metal Prod. Co. .... —
Armco Steel Corp. .... —
Asten-Hill Mfg. Co. .... —
Ateliers de Constructions Allimond .... —
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Bauer Bros. Co. .... —
Becco Chem. Div. Food Machy. Corp. .... —
Beloit-Eastern Corp. .... —
Beloit Iron Works Co. .... —
Binet, Louis et Cie .... —
Bird Machine Co. 13
Bixby, R. W. Inc. .... —
Black-Clawson Co. .... —
Bolton & Sons .... —
Brandon Sales, Inc. .... —
Broughton, A. E. & Co. ....Cover 2
Brown Company .... —
Bruderhaus (Maschinenfabrik Zum) .... —
Buckeye Cellulose Corp. .... —
Buffalo Forge Co. .... —
Buffalo Pumps .... —
Butterworth, H. W. & Sons Co. —
Cady, E. J. & Co. 44
Cadillac Associates Inc. .... —
Cameron Machine Co. .... —
Carthage Machine Co. .... —
Celgar Ltd. .... —
Cellulose Development Corp. .... —
Central Soya Co. .... —
Cesalpina S.P.A. .... —
Chemico .... —
Chromium Corp. of America .. —
Ciba Company .... —
Cincinnati Rubber Mfg. Co. .. —
Clark-Aiken Company .... —
Clarkson Company .... —
Classified Advertising 46
Cleveland Crane & Engrg. .. —
Columbia-Geneva Steel Div., U. S. Steel Corp. .... —
Columbia-Southern Chem. Corp. Sub. of Pittsburgh Plate Glass Co. .... —
Combustion Engrg. Co. .... —
Corn Products Sales Co. .... —
Crane Company .... —
Curtiss-Wright Corp. .... —
Davis, Frank H., Co. Inc. .... —
DeZurik Corporation .... —
Diamond Alkali Co. .... —
Dobeckmun Company .... —
Dodge Mfg. Co. .... —
Dorr-Oliver .... —
Dow Chemical Co. .... —
Dow Industrial Service Div. Dow Chemical Co. .... —
Doyle, J. E., Co. .... —
Draper Bros. Co. .... —
Dryden Paper Co., Ltd. 8
du Pont, E. I. de Nemours & Co., Dyes & Chem. Dept. .. —
Electrochemical Dept. .... —
Industrial & Biochem. Dept. —
Pigments Dept. .... —
Duverre Inc. .... —
Eaton Manufacturing Co. .... —
Ebasco Services, Inc. .... —
Economy Equipment Co. .... —
Egan, Frank W., & Co. .... —
Egger, Emile & Co. .... —
Electric Mchy. Mfg. Co. .... —
Elixman Paper Core Co. 45
Evans, W. P. & Son, Ltd. .... —
Export Supplement .... —
Farrel-Birmingham Co. .... —
Finckh, Herman .... —
Fitchburg Screen Plate Co .. —
Food Mchy. & Chem. Sales Dept., Chemicals & Plastics Div. .... —
Food Mchy. & Chem. Corp. Chlor-Alkali Div. .... —
Foxboro Co. .... —
Freeport Sulphur Co. .... —
Garlock Inc. .... —
Gaspesia Sulphite Co. Ltd. .... —
Gates Rubber Co. .... —
Geigy Chemicals Corp., Geigy Dyestuffs Co. .... —
General Dyestuffs Co. .... —
General Tire & Rubber Co. .... —
Gibbs-Brower Co. .... —
Gilbert & Nash Co. .... —
Glidden Company .... —
Goodyear International Corp. .. —
Goodyear Tire and Rubber Co. —
Gottesman-Central National Org. .... Front Cover
Goulds Pumps .... —
Great Eastern Packing & Paper Stock Corp. .... —
Green, Inc., Frank B. .... —
Greening & Sons, Ltd. .... —
Grinnell Co., The 34B
Hamblet Machine Co. .... —
Harbison Walker Refractories .. —
Hardinge Company, Inc. .... —
Harris-Seybold .... —
Hayssen Mfg. Company .... —
Heimbach, Thomas I. .... —
Hercules Powder Co. .... —
Hooker Chemical Co. .... —
Houghton & Company .... —
Huber, J. M. Corp. .... —
Hudson Sharp Machine Co. .. —
Hungerford & Terry, Inc. .... —
Hunt, Rodney .... —
Hunt & Moscrop .... —
Huyck Felt Company .... —
Hyster Company .... —
Improved Machinery, Inc. 4
Ingersoll-Rand Co. .... —
Inglis, John, Co. .... —
Industriplanering .... —
Jagenberg, Werke .... —
Jamesbury Corp. 33
Jenkins Brothers .... —
Johns-Manville Corp. 3
Johnson, Alvin H., Co. .... —
Johnson Corp., The .... —
Jola, G.m.b.H. .... —
Jones, E. D., Corp. .... —
Kalamazoo Tank & Silo Co. .. —
Kamyr, Inc. .... —
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Kellogg, M. W. Company .... —
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La Papeterie .... —
Laporte Titanium Ltd. .... —
Lawson Company .... —
Layton-Greenfield Inc. .... —
Lestoil, Inc. .... —
Link-Belt Co. .... —
Lob, Albert Maschinen und Apparatebau .... —
Lockport Felt Co. .... —
Lockwood Greene Engineers .. —
Lodding Engineering Co. 41
L'Homargy .... —
Lunkenheimer Co. .....Back Cover
Lyddon & Co. .... —
Main, Charles T., Inc. 43
Manchester Machine Co. .... —
Marathon—A Division of American Can .... —
Mead Pulp Sales, Inc. .... —
Miehle-Goss-Dexter .... —
Miller Corp., Harry .... —
Millspaugh, Ltd. .... —
Minerals & Chem. Philipp Corp. —
Minneapolis-Honeywell .... —
Mixing Equipment Co. .... —
Monsanto Chemical Co. .... —
Montague Mch. Co. .... —
Moore & White Co. .... —
Morden Machines Co. .... —
Mt. Vernon Mills, Inc. .... —
Murray, D. J., Mfg. Co. .... —
Nalco Chemical Co. .... —
Nash Engineering Co. .... —
National Perforating Co. .... —
National Starch & Chemical Corp. .... —
National Tube Div., U. S. Steel Inc. .... —
Newport News Shipbldg. & Dry Dock Co. .... —
New Jersey Zinc Co. .... —
Nichols Eng. & Research Corp. .... —
Nopco Chemical Co. .... —
Northeastern Paper Sales 8
Norton Co. .... —
Oakite Products Inc. .... —
Olin Mathieson .... —
Osborne Paper Mill Equipt. Co. 49
Overly's Inc. .... —
Paper Conv. Mch. Co. .... —
Parsons & Whittemore .... —
Patton Mfg. Co. .... —
Penick & Ford .... —
Penn. Ind. Chem. Corp. .... —
Penobscot Chemical Fibre Co. .. —
Pennsalt Chem. Corp. .... —
Perkins, B. F. & Sons Inc. .. —
Perkins Goodwin Co. .... —
Permutit Co., Div. of Pfaudler Permutit Inc. .... —
Pfaudler Permutit Inc., Permutit Div. .... —
Pioneer Paper Stock Co. 43
Potdevin Machine Co. .... —
Powell Valves .... —
Price & Pierce, Ltd. .... —
Puget Sound Pulp & Timber .. —
Raymond, Charles P., Service .. —
Rayonier, Inc. .... —
Record Fdy. & Mch. Co. .... —
Red Rav Mfg. Co. .... —
Reichhold Chemicals .... —
Rhoads, J. E., & Sons .... —
Rice Barton Corp. .... —
Riedel, Gus & Son 41
Riegel Paper Corp. .... —
Rockwood Sprinkler Co. .... —
Rohm & Haas Co. .... —
Ronningen-Petter Co. .... —
Roosevelt Paper Co. .... —
Ross, J. J., Co. .... —
Ross, J. O., Engrg. Co. .... —
Ross Midwest Fulton Corp. .... —
Ross Paper Machinery Co. .... —
Ruderman Machinery Service . 48
Rust Engineering Co. 43
Ryerson, Jos. T., & Son .... —
Sandoz Chem. Wks. .... —
Sandy Hill Iron & Brass Wks. —
Scapa Dryers Inc. .... —
Seaboard Air Line R. R. Co. . —
Shawinigan Resins Corp. .... —
Sheffield Corp. .... —
Shuler & Benninghofen .... —
Signode Steel Strapping Co. .... —
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St. Regis Paper Co., Kraft Div. —
St. Regis Paper Co., Panelyte Div. .... —
Sturge Ltd., John & E. .... —
Sulzer Brothers .... —
Sunday, George M., Assoc. 47
Taylor Instrument Co.'s .... —
Taylor-Wharton Company 6
Tennessee Coal & Iron Co. .... —
Tennessee Corp. .... —
Texaco, Inc. .... —
Texas Gulf Sulphur .... —
Thermal Equipt. Corp. .... —
Thiele Kaolin Co. .... —
Thiry & Company .... —
Thomas Paper Stock Co. 45
Titanium Pigment Corp. ....Cover 3
Torrington Company .... —
Tyer Rubber Company .... —
United Engrg. & Fdy. Co. .... —
Universal Metal Hose Co. .. —
U. S. Industrial Chem. Co. Div. of National Distillers & Chem. Corp. .... —
U. S. Steel Corp. .... —
United States Steel Export .. —
United States Steel Supply Co. —
Valley Iron Works .... —
Vanderbilt, R. T., Co. .... —
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Voith, J. M., G.m.b.H. .... —
Waldron-Hartig Div., Midland Ross Corp. .... —
Wallingford Steel Co. .... —
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West End Chemical Div., Stauffer Chem. Co. .... —
Weyerhaeuser Co. 34A
Williams-Gray Co. .... —
Wisconsin Wire Works .... —
Witco Chemical Co. .... —
Woodpulp, Inc. .... —
Wyandotte Chem. Corp. .... —

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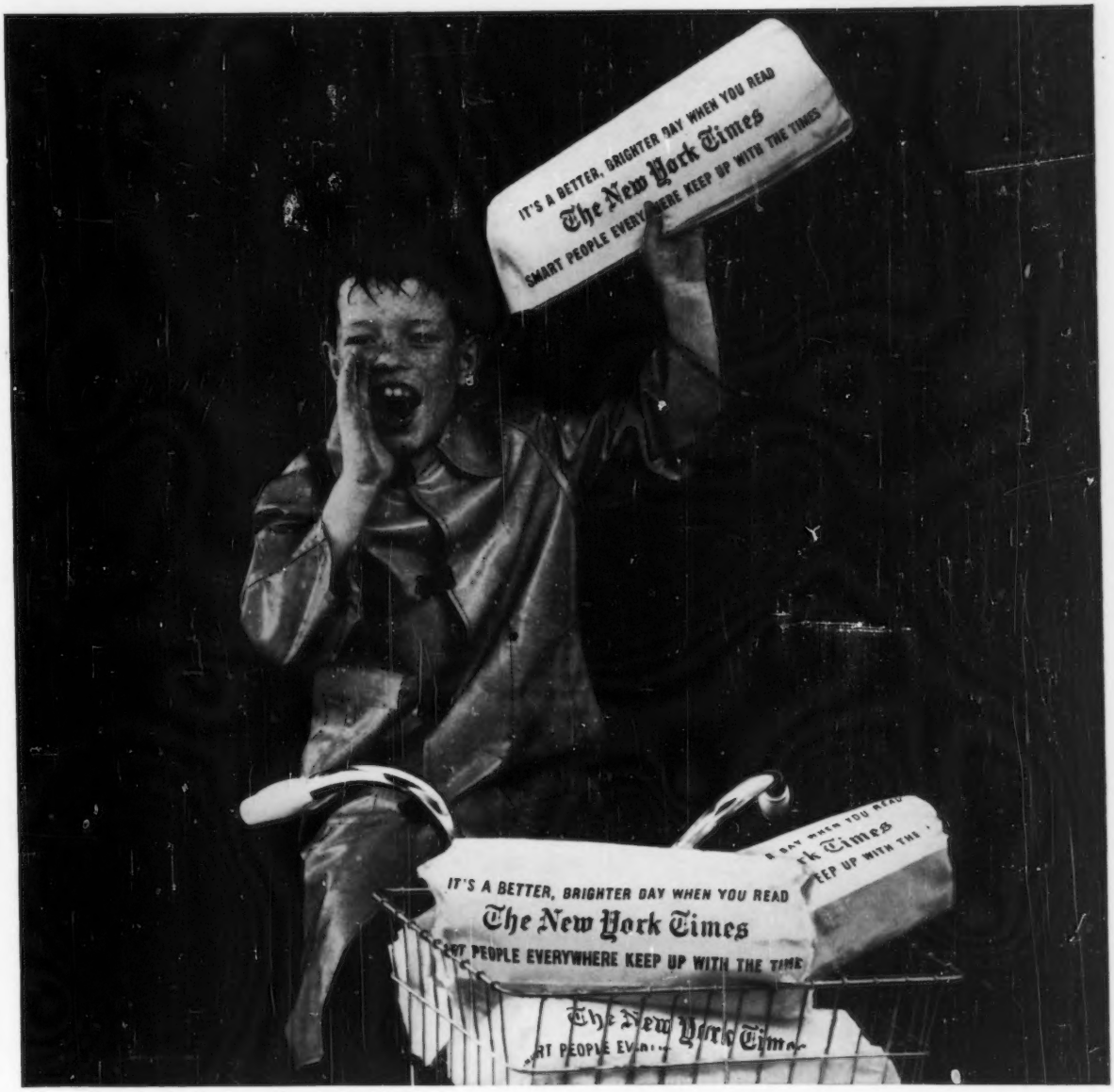
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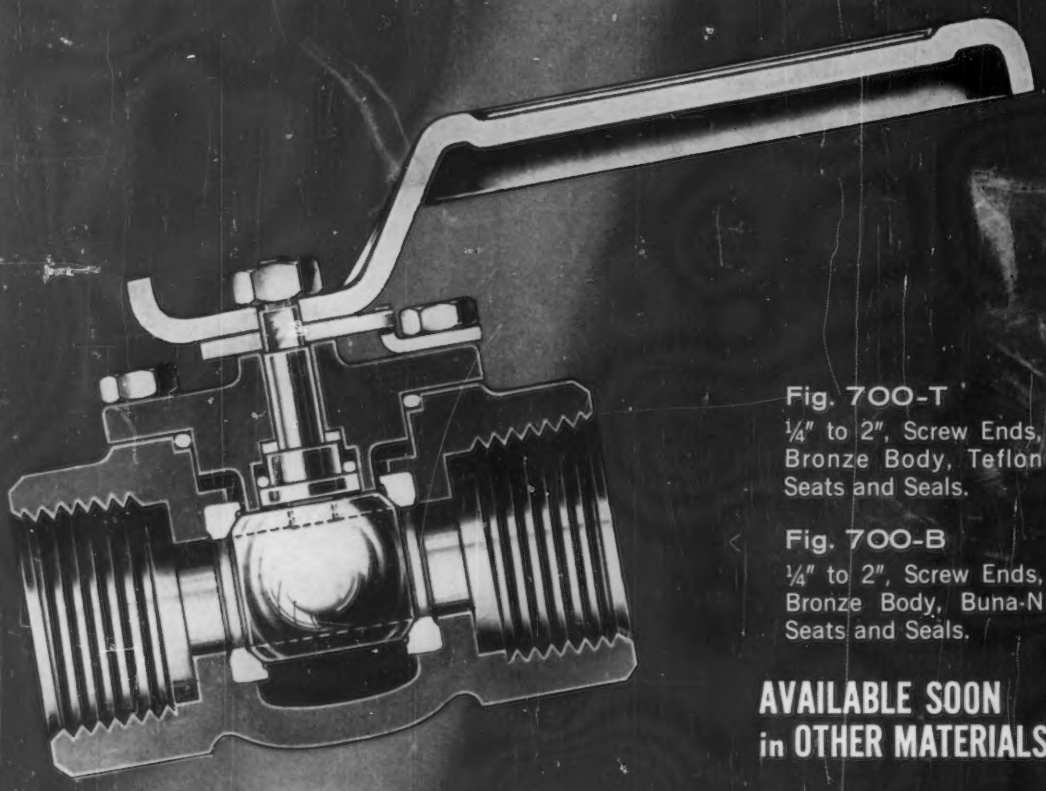

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